NARRATIVE REPORT

MALHEUR NATIONAL WILDLIFE REFUGE

REGION I

1966

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
Malheur National Wildlife Refuge
P. O. Box 113
Burns, Oregon 97720

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Narr. Report
inside cover

March 14, 1967

Refuge Manager, Malheur Refuge
Burns, Oregon

Acting Regional Supervisor, Division of
Refuges, Portland, Oregon

Narrative Report for 1966 - Malheur Refuge

The subject report represents a very fine piece of work and we wish to compliment you on its preparation. The biological sections are particularly well done; it is obvious Mr. Duebbert is going to be difficult to replace.

Certainly the colored photographs contribute to the report. Congratulations on an excellent report.

George L Wiseman

George L. Wiseman

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Malheur National Wildlife Refuge
Burns, Oregon

Narrative Report for Period January 1 to December 31, 1966

Roster of Permanent Personnel

John C. Scharff	Refuge Manager
Walter L. Anderson 6/6/66 to 9/10/66)	Student Trainee (Biology)
William G. Ankney (Transferred 3-13-66)	Maintenanceman
Noel L. Cagle	Maintenanceman Foreman III
Ivan J. Carey	Refuge Clerk
Jack D. Coulter (E.O.D. 8-28-66)	Maintenanceman
Quentin L. Currey	Maintenanceman
Jack A. Dalton	Maintenanceman
Raymond N. Davis	Oiler WAE
Harold F. Duebbert (Transferred 11-6-66)	Wildlife Biologist (Mgmt.)
Irma G. Gail	Clerk-Stenographer
Marvin L. Jess	Dragline Operator
Marselle Leake	Mechanic (Heavy Duty)Foreman
Alfred S. Ludi (Retired 12-30-66)	Building Repairman
Delano A. Pierce	Refuge Manager
Elmer D. Reynolds	Mechanic, Heavy Duty
Norbert J. Schekall	Caretaker
C. Fred Zeillemaker (Furloughed 7-10-66)	Wildlife Biologist (Mgmt.)

Roster of Temporary Personnel

Robert L. Arnold (E.O.D. 8-9-66)	Truck Driver
Herbert C. Davis (1-5-66 to 7-3-66)	Operator General (LD)
Joe L. Ingley (E.O.D. 12-7-66)	Maintenanceman
Guy W. Leslie (1-3-66 to 7-2-66)	Laborer
Robert K. Williams (6-13-66 to 8-26-66)	Truck Driver
Robert W. Worsham (Terminated 5/27/66)	Truck Driver

Double-O Ranch Station

	Precipitation				Max.	Min.
	Snowfall	This Month	Normal		Temp.	Temp.
January	4.3	.73	.84		49	0
February	2.8	.17	.67		51	4
March	0	.43	.55		76	10
April	0	.21	.51		78	16
May	0	.80	1.00		88	22
June	0	1.26	.97		87	31
July	0	.17	.25		95	34
August	0	.38	.29		96	33
September	0	1.35	.35		90	28
October	0	.28	.62		82	11
November	0	2.78	1.00		67	10
December	0	1.09	.96		51	9
Total	7.1	9.65	8.01	Extremes	96	0

Buena Vista Station

	Precipitation			Max.	Min.
	Snowfall	This Month	Normal	Temp.	Temp.
January	5.2	1.08	.71		
February	3.5	.25	.55		
March	3.1	.34	.40		
April	0	.56	.57		
May	T	.86	1.11		
June	0	.94	.97		
July	0	.33	.35		
August	0	.12	.50		
September	0	1.36	.61		
October	T	.33	.79		
November	2.0	1.99	.89		
December	.5	.99	.73		
Total	14.3	9.15	8.18		

Malheur National Wildlife Refuge
Annual Narrative Report
January 1 to December 31, 1966

I. GENERAL

A. Weather Conditions

Headquarters Station

Precipitation

	Snowfall	This Month	Normal		Max. Temp.	Min. Temp.
January	8.0	.58	.88		50	0
February	1.0	.12	.73		50	6
March	1.5	.30	.72		76	10
April	0	.36	.51		78	16
May	0	.49	1.13		88	24
June	0	1.06	1.05		86	30
July	0	.19	.30		95	34
August	.5	.64	.34		95	28
September	0	1.25	.57		91	29
October	0	.22	.89		80	12
November	.5	2.17	.99		69	13
December	3.3	1.09	.99		51	4
Totals	14.8	8.47	9.10	Extremes	95	0

P-Ranch Station

Precipitation

	Snowfall	This Month	Normal		Max. Temp.	Min. Temp.
January	3.6	.93	.92		54	2
February	3.6	.50	.75		52	5
March	.7	.19	.98		81	10
April						
May						
June						
July						
August						
September	0	.83	.51		93	23
October	0	.06	.99		81	13
November	0	1.82	1.08		75	8
December	0	.83	1.14		54	13
Totals	7.9	5.16	6.37	Extremes	93	2

Headquarters Evaporation Station

	Miles of Wind	Inches of Evaporation
May (Activated 5/13)	1,068	5.19
June	1,551	8.53
July	1,516	11.61
August	1,012	10.53
September	990	6.29
October (Discontinued 10/15)	650	2.10
Totals	6,787	44.25

Comparative records for similar periods over the past four years follow:

1963	5,651	35.71
1964	5,943	35.54
1965	5,178	32.59
1966	6,787	44.25

Generally this area enjoyed a very temperate year. The high of ninety-six with a low of zero makes for a rather mild report period. At no time did frost penetrate the ground to any great depth.

Precipitation was again short of normal with a little under eight and a half inches for the year. Seven months of the year produced short of normal rainfall and only the months of September and November recorded any appreciable amount above the average. Most precipitation periods over the year were spotty, and general storms were few. Over the refuge, July and August were quite dry with well above average amounts of wind and evaporation. Frosty conditions prevailed every month of the year, with the exception of July, and spots of frost damage were evident that month in areas of poor air drainage.

B. Habitat Conditions.

1. Water. The dreary outlook for water reported a year ago didn't improve with the advancing seasons and 1966 will go down in history as being one of the dry years. On January 1, the snowpacks on all watersheds serving the Malheur Refuge were short and little improvement occurred subsequent to that time. March through May were cold and windy months and didn't contribute toward good melting conditions for the little snow that was on the stream drainages. The elevations that furnish the bulk of the irrigation water had but little snow, and it was mostly blown away by the wind as it melted. At no time did any of the streams reach flood stage. As of April 1 the Blitzen River was forecast to run forty-eight per cent of normal, Silvies

River forty-six per cent and Silver Creek forty-six per cent. The flow records aren't available at this time, but it is very doubtful if the stream productions reached the forecast.

In the Blitzen Valley part of the refuge, none of the areas received the normal amount of water and a large percentage of the valley received no water. All of the carryover in Krumbo Reservoir and Boca Lake was used. Little water reached the refuge from the Diamond drainage and the ranches in Diamond Valley harvested about half a hay crop. That part of the refuge watered by Diamond drainage received a little early water, but it was only poor judgment on the part of the upstream ranchers that the refuge fared as well as it did. It was only through early utilization of the little water in the Blitzen drainages that any habitat prevailed and some hay was harvested. Normal handling of the water would have resulted in a lot less good habitat than was actually enjoyed.

The Double-O Unit of the refuge received but little water from Silver Creek and this was dissipated prior to nesting season. During the winter the spring water was shoved out north as far as possible and then later used in marshes to the east. In manipulating the spring water in that manner, considerable good habitat was had in that particular unit. Then again in the fall the spring water was split, about half it going to the north and the rest serving the eastern marshes. Handling the spring water in this way created some very desirable fall water, but the absence of the grain field nearby seemed to make this area lack the attraction for waterfowl use as normally. Ranches on Silver Creek with reservoirs having good carryovers harvested near normal crops, but those depending entirely on the flow of the creek were drastically short on production.

Very little water reached Malheur Lake from Silvies River. The small amount that was received from this source came in January and February as all of the stream was turned out for irrigation real early. Harney Valley generally harvested a thirty per cent hay crop, and this was brought about by the late winter and early spring use of the little water that did come. Very little grain was attempted in Harney Valley this year and poor yields were experienced with the small acreage that was planted. By mid August all streams had reached a low ebb and many short drainages had ceased to flow. No water was reaching the refuge from the Diamond drainage and, for the first time in a good many years, cattle grazing in Diamond Swamp had to go to the Blitzen River for a drink. The Blitzen River proper didn't flow enough water for a time to run the full length of the valley and had to be augmented by Bridge Creek water to maintain a flow throughout the entire valley. Mid-September rains relieved the situation somewhat and bolstered the stream flows to where Diamond water barely reached the refuge. The flows

then tailed off again during much of October, but the November-December precipitation really changed the picture. All streams increased in flow and many dry draws ran water for the first time since the December 1964 floods. Sustained flows to the end of the period were well above average.

By mid-March, Malheur Lake was ice free and the level stood at 3.30 on the gauge, which was ten hundredths above the freeze up in the fall. By April 1, it was noticeably receding and continued on the downward trend until the end of October when it reached .96 on the gauge. By the end of the report period it had made some recovery and the gauge read 1.57.

The excellent pothole habitat in the western portion of Malheur Lake dried early and much of it wasn't usable for late nesting waterfowl. The last reading for the Narrows gauge was May 23, and it then was on dry land.

Krumbo Reservoir was drained in July and the stream and remaining small amount of water later was treated for rough fish. The gates were then closed and it is now filling with water from the springs on that watershed. With just a little help from snow water, this sixteen hundred acre feet reservoir should fill.

Boca Lake was drained to give the bottom a drying out period, but it should fill again from the winter flow of Bridge Creek and the East Side Canal.

The entire drainage basin of Malheur Lake went into the winter in excellent condition so far as soil moisture was concerned. Snow packs are short and little frost is in the ground. At the moment the outlook for water in 1967 is rather bleak, but one good storm could change the picture in a very short time.

One discouraging aspect of the situation is that all reservoir carryover has been used and lakes and marshes are short. At this writing, the start is from scratch and relief will have to come from late winter storms, or else another dry year will prevail. Well above average stream flows will be required to furnish sufficient irrigation water and restore some carryover in reservoirs and lakes.

2. Food and Cover. Generally, aquatic food production in Malheur Lake was not as good as in 1965. Production of sago pondweed this year was about 3,500 acres compared with last year's 8,000 acres. The best stands of sago were between Cole Island and the "Juncus Ridge" in east Malheur Lake. Other good stands were in Vickers Lake and Bat House Bay in West Malheur Lake and along the north shore of the center section.

The area of about 2,500 acres east of Cole Island held water through the fall migration period and supported most of the waterfowl population at this time. Tubers of sago were utilized heavily for food.

Unit 4, which is the west section of Malheur Lake, was all dry by September 1, except for Vickers Lake which held some water until early November.

Much of the prime food producing acreage of Malheur Lake was dry by October 1. This included several hundred acres of sago beds and perhaps accounted in part for the lower peak waterfowl populations during the fall.

As water levels receded during the summer, the mudflats became rapidly vegetated with a large variety of forbs, grasses and sedges. Succession proceeded so rapidly in places that areas which were bare mud in mid-July were solidly vegetated by the end of August. Canada geese utilized short grasses on the more recently exposed areas quite heavily.

Ice went off Malheur Lake on March 13, after having been covered continuously since mid-December of 1965. The lake then remained open for the remainder of the spring and was in excellent condition for spring migrants. Skim ice was formed on the lake during the third week of October for short periods, but final freeze-up for the winter did not occur until late november.

An excellent stand of nodding smartweed (Polygonum lapathifolium), covering about 150 acres, developed on perimeter mudflats of Boca Lake. Best stands were in the southwest corner. The plants showed great vigor, attained a height of over five feet and produced a very heavy seed crop. Plant growth was rapid enough to permit maturity of the seed before autumn frosts occurred.

When flooded shallowly to depths of 6 to 12 inches next spring, assuming water is available, this will provide an abundance of natural waterfowl food. A photo in the picture section illustrates this fine stand of smartweed.

The West Knox Pond field produced a good crop of wheat this year and was used by as many as 2,500 sandhill cranes in September. When the field was flooded in October, large numbers of mallards, pintails and Canada geese moved in for the feast.

Mud Lake grain fields produced only a very poor crop of barley, due to frost damage in early August. The Double-O grain field was not seeded at all because of the water shortage in that area.

Existing populations of upland game birds were well taken care of so far as food is concerned. In the late fall and early winter, predation seemed to be heavier than normal, perhaps owing to the large population of raccoon. Because of the dearth of rodents and other foods, both coyotes and raccoon seemed hard put to garner a living.

Both mule deer and pronghorns fared well from the standpoint of food.

II. WILDLIFE

A. Migratory Birds.

1. Waterfowl.

a. Swans. The spring population of whistling swans attained a peak of 15,000 during the week of March 12-18. A few whistlers (100 or so) wintered here, but the first migrants did not arrive in numbers until the first week of March. Most of the population utilized Unit 4 and Unit 6 of Malheur Lake, which are the east and west sections, respectively. These units are also the best sago pondweed producers, a choice food of these majestic birds. Fall migrating whistling swans arrived during the week of October 6-12. Peak fall populations occurred the third week of November when approximately 8,000 were present.

Trumpeter swans enjoyed a fairly good production year. Broods were hatched and reared at the following locations this year: Unit 9 Pond (1 cygnet); Knox Spring Pond (3 cygnets); Benson Pond (3 cygnets); Bat House Bay of Malheur Lake (6 cygnets) for a total of 13. Two newly hatched cygnets were seen at Unit 8 Pond but were not ever seen again, so apparently they suffered a disastrous fate. Falling water levels forced all the families to move from their nesting ponds prior to the time the cygnets could fly. The Unit 9 family moved to the Blitzen River immediately adjacent to the pond; the Knox Spring family moved to Knox Pond, a distance of one-fourth mile

via canal; and the Bat House Bay family moved to the adjacent center portion of Malheur Lake. All of these above movements were relatively simple, but the movement of the Benson Pond family to Boca Lake required an overland trip of at least 2½ miles.

A female which was incubating a clutch of three eggs in Push-Up Pond was found dead on June 1. There were no visible signs of external injury, but the bird was very thin with a weight of only 15 pounds. This female was one of the original transplants from Red Rock Lakes as a cygnet in 1956 and still retained the stainless steel locking band.

The first trumpeter family to arrive at traditional wintering quarters at Sod House Spring Pond was the one from Unit9 (2 adults and 1 cygnet). They arrived on October 3 and came up immediately for their ration of grain. The refuge trumpeter flock didn't show in the usual number at the headquarters spring in November and December. A few whistling swan were co-mingled and it was difficult to determine just how many trumpeters were coming in. By the end of December, the best count revealed twenty-seven trumpeters, seven of which were cygnets. However, all through December a number of whistling swan were using other water such as Malheur Lake and Boca Lake and undoubtedly the local trumpeter flock was pretty well dispersed. On December 31, several were observed using the Blitzen Valley water and several come and go at the Double-O.

b. Geese. The total population of Canada geese was similar to 1965, except that there was better production on the refuge than last year. This is probably a reflection of poorer nesting habitat outside of the refuge and more nesting effort in Malheur Lake. Although water conditions were generally poor later in the summer, they were good for the earlier nesting geese.

An experiment with nesting structures in Knox Pond yielded some interesting results. In February, 16 wire baskets were placed in old willow trees and filled with hay. In early March, it was obvious that most of the baskets were being used by geese. A check on May 17 showed the results shown in Table 1. Also see photos in the picture section. Location of the nesting sites is shown on Map 1.

The success of this small scale experiment emphasizes the great potential for using artificial nest sites as a technique for increasing Canada goose production here. Resident Canada geese in this area apparently have well-established innate behavior for nesting at elevated sites for under natural conditions they show a strong preference for muskrat lodges, rimrock ledges, haystacks, etc.

MAP 1.

CANADA GOOSE NESTING BASKETS

KNOX POND

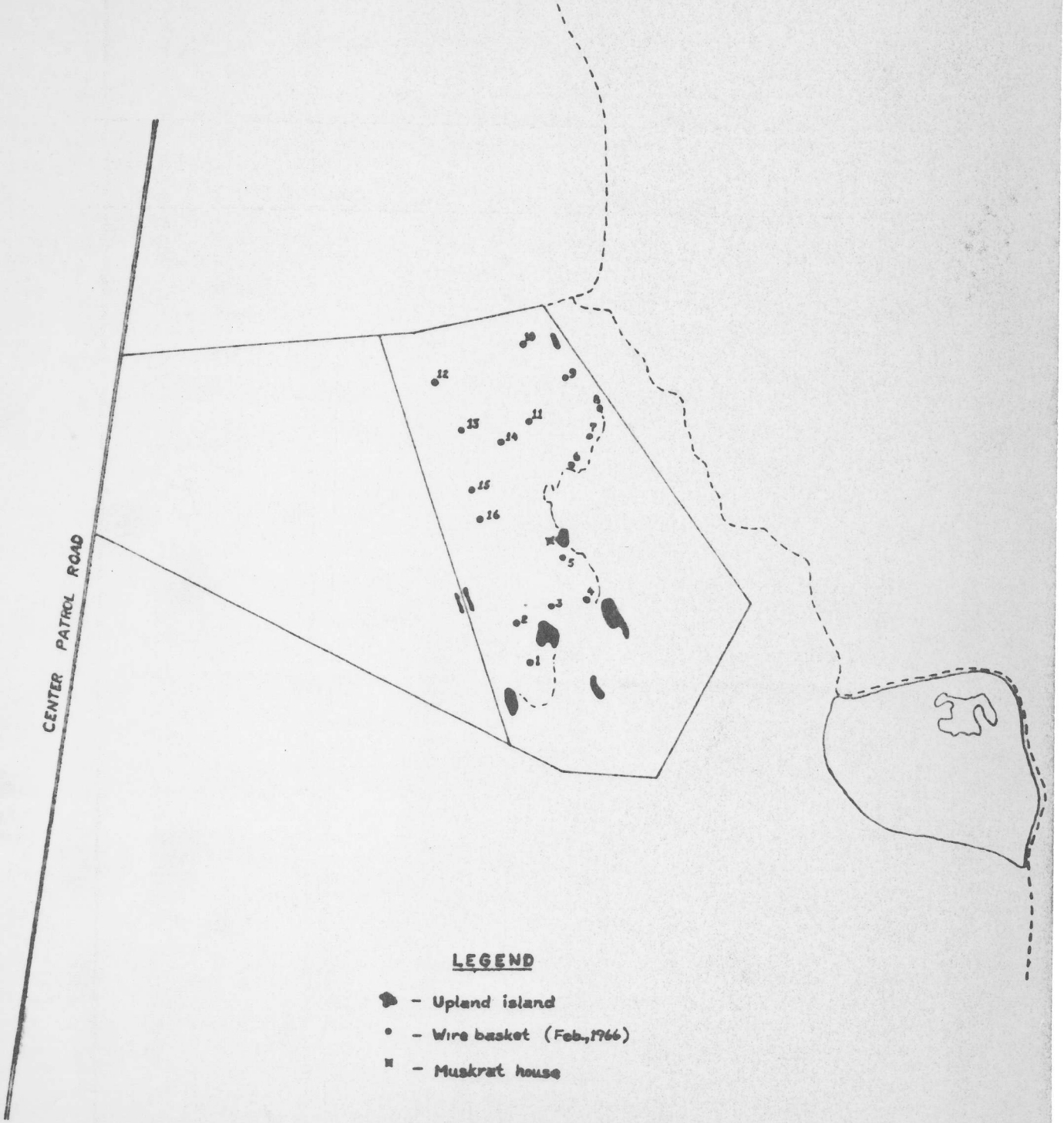


Table 1. Utilization of artificial Canada goose nest sites and hatching success in East Knox Pond, 1966

(Checked on May 17, 1966)

Nest Site*	Used	Fate of Nest
1	Yes	Successful; all eggs hatched.
2	Yes	Flooded by waves; 3 dead goslings in nest.
3	Yes	Successful; all eggs hatched.
4	Yes	Female incubating clutch of 4 eggs.
5	Yes	Successful; all eggs hatched.
6	Yes	Female incubating clutch of 8 eggs.
7	Yes	Successful; 2 unhatched eggs left in nest. (full grown embryo)
8	Yes	Successful, all eggs hatched.
9	Yes	Successful; all eggs hatched.
10	Yes	Successful; 1 infertile egg in nest.
11	Yes	Successful; 1 ten-day embryo left in nest.
12	Yes	Successful; all eggs hatched.
13	Yes	Successful; all eggs hatched.
14	No	Hay blown from nest.
15	Yes	Successful; all eggs hatched.
16	Yes	Successful; all eggs hatched.

Use of the refuge by snow geese was less during the spring than for the past several years. We assume this is a reflection of the lower flyway population as a result of very poor reproduction in the major breeding areas in 1965 and the dearth of suitable habitat in Harney Valley. During the fall migration a good ratio of immature to adult birds was observed, in the relatively small numbers that visited the refuge.

On January 26, three "small" Canada geese were captured and banded. This is the first known occurrence of these birds on the refuge, although undoubtedly they have been present in past years. Measurements of these birds indicated that they were the subspecies Branta canadensis taverni according to Delacour: Waterfowl of the World. The three birds captured were part of a family group of five. Measurements of the ones captured were as follows:

Characteristic	Measurements		
Age - Sex	Immature Female	Adult Female	Immature Female
Wing	371mm	405 mm	380 mm
Tail	132 mm	135 mm	115 mm
Culmen	33 mm	36 mm	35 mm
Tarsus	73 mm	72 mm	60 mm
Mid-toe	62 mm	70 mm	67 mm
Bursa	32 mm	none	33 mm
Weight	3-3/8 lb.	3-7/8 lb.	3-1/4 lb.
White neck ring	none	yes	none

c. Ducks.

Production - In comparison with the excellent duck production of 37,000 in 1965, this year's 13,000 was disappointingly low. The breeding population was very similar in size to the one in 1965 (about 15,000 pairs), but productivity rates were very low due to poor water conditions. Large flocks of paired birds

remained on available water areas, and the females apparently did not attempt to nest at all. This phenomenon was most prevalent among the species which traditionally nest late: cinnamon teal, gadwall and redhead. The earlier nesting mallard and canvasback had better success.

Table 2 portrays the species composition and distribution by ecological unit of the 1966 breeding duck population. Table 3 presents data on the 1966 brood surveys. Table 4 presents a summary of average duck brood sizes for the three-year period, 1964-1966. Following this table are "hatching curves" for the mallard, gadwall, cinnamon teal and redhead, the four most abundant nesting species at Malheur during 1964, 1965 and 1966.

In summary, although considerably below the average and maximum potential for this area, the production of 13,000 ducks under habitat conditions existing this year was as much as could be expected. The deficient production appeared to be a result of non-breeding by many pairs as a result of overcrowding on the available water. In other words, there was not sufficient habitat to permit the completion of behavioral aspects of spacing necessary for successful reproduction. Also, broods which hatched were forced to move long distances overland to brood water and also brood movements between water areas during maturity to flight stage were more prevalent than normal. Also, it appeared that predation rates were higher. These factors were reflected in lower brood sizes and, consequently, lower net production.

Migrations - Migratory populations of ducks on the refuge followed patterns about the same as usual. Habitat for spring migration was adequate, but during the fall was below par. Much of the best habitat in Malheur Lake was dry, and also most of the Blitzen Valley and Double-O. Populations of pintails were lower during fall migration than in 1965, in spite of reports of better reproduction in major nesting areas. More transient use was made of Harney Lake during fall migration than in 1965, but this was not prolonged.

Unusual Observations -- Two European widgeon were captured and banded at Sod House Spring in January. The species was observed several times on the Blitzen River near headquarters and at Benson Pond until late April. A hybrid mallard x widgeon was captured near Benson Boat House on March 16. (See photo in picture section)

d. Coot. Production of coots was only a small fraction of that in 1965, with practically no nesting in the Double-O or Blitzen Valley units. Nesting in Malheur Lake was much less than last year. Migratory populations in both spring and fall were also less.

Table 2. Duck breeding population, Malheur NWR, 1966

Based on sample ground transects, May 24-June 8, 1966

SPECIES	ECOLOGICAL UNITS 1		2		3		4		5		6		7		8		9
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A
Mallard	100	225	-	25	21	75	63	250	105	300	49	150	84	250	40	75	59
Gadwall	85	300	-	50	42	150	162	600	197	800	91	300	92	200	37	100	43
Pintail	9	25	-	-	9	20	11	50	14	30	8	20	28	50	14	15	3
Green-winged Teal	5	25	-	-	1	5	3	25	2	10	1	10	4	10	-	5	-
Blue-winged Teal	3	25	-	-	3	30	11	60	3	30	6	50	13	50	4	10	10
Cinnamon Teal	66	300	-	25	43	150	191	800	253	900	235	800	158	400	40	150	70
American Widgeon	14	50	-	-	8	15	1	25	11	50	16	50	44	100	6	10	4
Shoveler	5	25	-	-	4	10	8	50	14	50	4	25	40	75	11	15	14
Redhead	24	50	-	-	34	50	104	400	71	500	20	100	22	50	25	50	58
Canvasback	-	10	-	-	2	10	22	150	2	100	5	25	-	10	-	-	-
Lesser Scaup	1	10	-	-	-	-	6	25	3	50	1	10	5	10	3	10	-
Ruddy Duck	-	10	-	-	5	15	42	100	24	300	1	25	1	10	-	5	-
Common Merganser	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-
Totals	312	1055	-	100	172	530	624	2535	699	3120	437	1565	491	1215	180	450	261
Coot	25	125	-	-	85	250	650	1500	500	4000	130	900	15	100	7	75	17

A - Pairs observed on transects
B - Estimated total pairs in unit

*Based on observed pairs (Col. A)

Misc. Notes - (on transects)

1 pr. Ring-necked ducks observed in Unit 4 (prob. breeders)

1 pr. Common goldeneye observed in Unit 4 (prob. non-breeders)

	10		11		12		TOTAL		
B	A	B	A	B	A	B	A	%*	B
200	5	25	40	200	69	300	635	17.0	2075
300	4	50	99	300	89	500	941	25.2	3650
10	2	10	5	25	3	15	106	2.8	270
-	-	5	-	10	2	15	18	.5	120
50	-	10	-	25	1	10	54	1.4	350
500	5	100	51	400	61	600	1173	31.5	5125
25	-	10	4	25	16	50	124	3.3	410
50	-	10	11	25	4	25	115	3.1	360
150	-	20	36	150	12	75	406	10.9	1595
10	-	5	-	25	14	25	45	1.2	370
5	-	5	6	15	4	10	29	.8	150
-	-	5	-	10	4	10	77	2.1	490
10	-	-	1	10	4	10	5	Tr.	35
1310	16	255	253	1220	283	1645	3728	99.8	15000
200	7	150	160	800	100	600	1696		8700

Ratio Cinnamon teal to B.w. teal 95.5% to 4.5%.

Table 3. 1966 Brood Count - Malheur NWR

SPECIES	Ecological Unit 1	2	3	4	5	6	7	8	9	10	11	12	A	TOTAL %*	B
Mallard	9		32	62	7	0	19	21	6	45	32	52	285	28.1	2500
Gadwall	8		4	111	73	11	24	12	5	5	31	29	313	30.8	4400
Pintail	0		1	5	1	0	4	2	1	2	1	0	17	1.7	300
Green-winged Teal	0		0	0	0	0	1	1	0	2	0	0	4	.4	100
B.w./Cinnamon Teal	10		16	32	7	3	30	7	6	13	23	9	156	15.4	2000
American Widgeon	0		0	5	0	0	14	3	1	4	0	11	38	3.7	400
Shoveler	1		1	3	0	0	2	0	1	4	0	0	12	1.2	200
Redhead	0		1	33	14	7	5	5	3	6	7	4	85	8.4	1500
Canvasback	0		7	58	5	1	0	0	0	0	0	1	72	7.1	1000
Lesser Scaup	0		0	1	0	0	0	0	0	0	0	0	1	Tr.	100
Ruddy Duck	0		0	20	3	0	2	0	1	1	1	1	29	2.9	300
Common Merganser	0		0	0	0	0	0	0	1	1	0	1	3	.3	200
TOTAL	28		62	330	110	22	101	51	25	83	95	108	1015	100.0	13000

No Brood Counts Taken

* = Based on observed broods

A = Broods observed

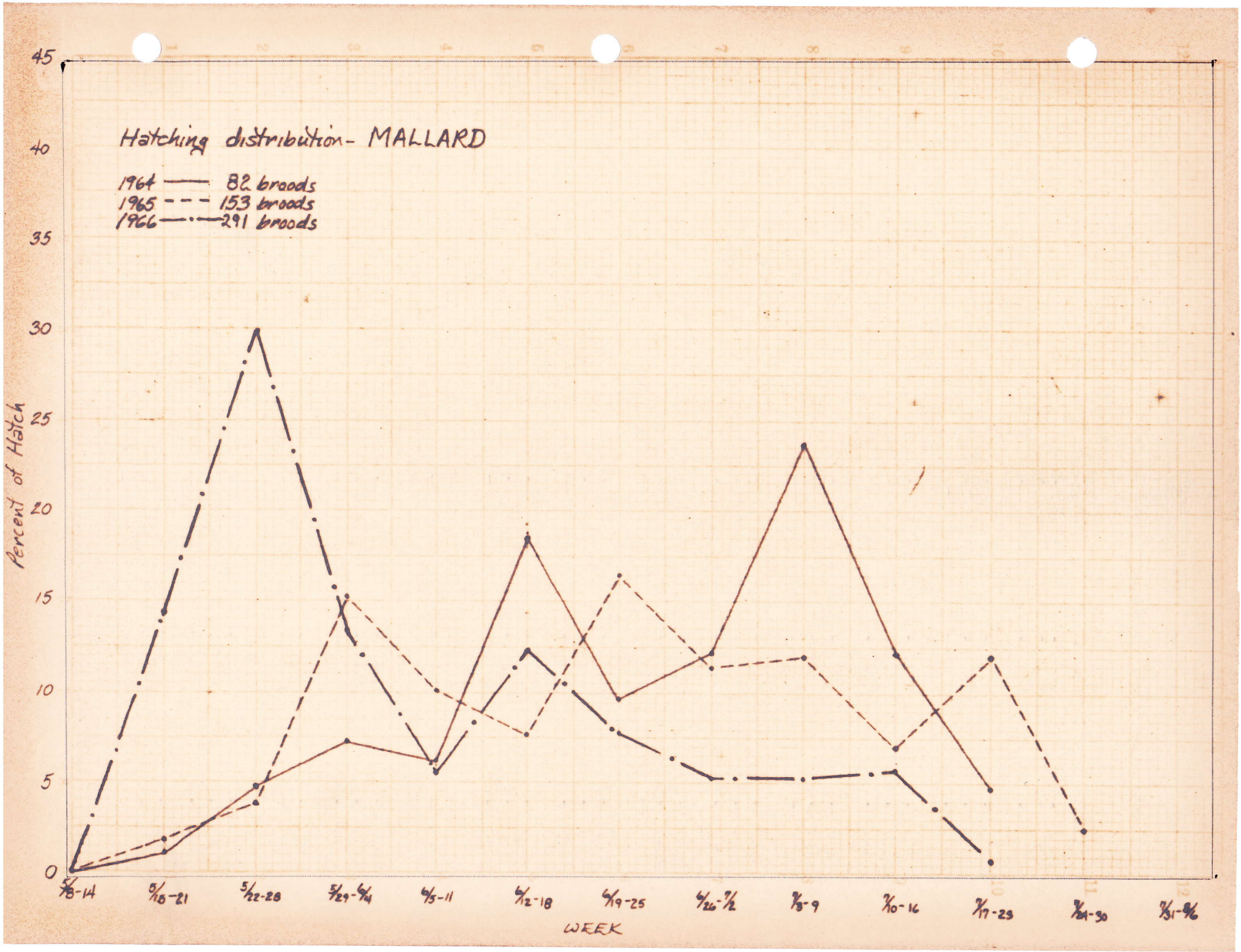
B = Est. production

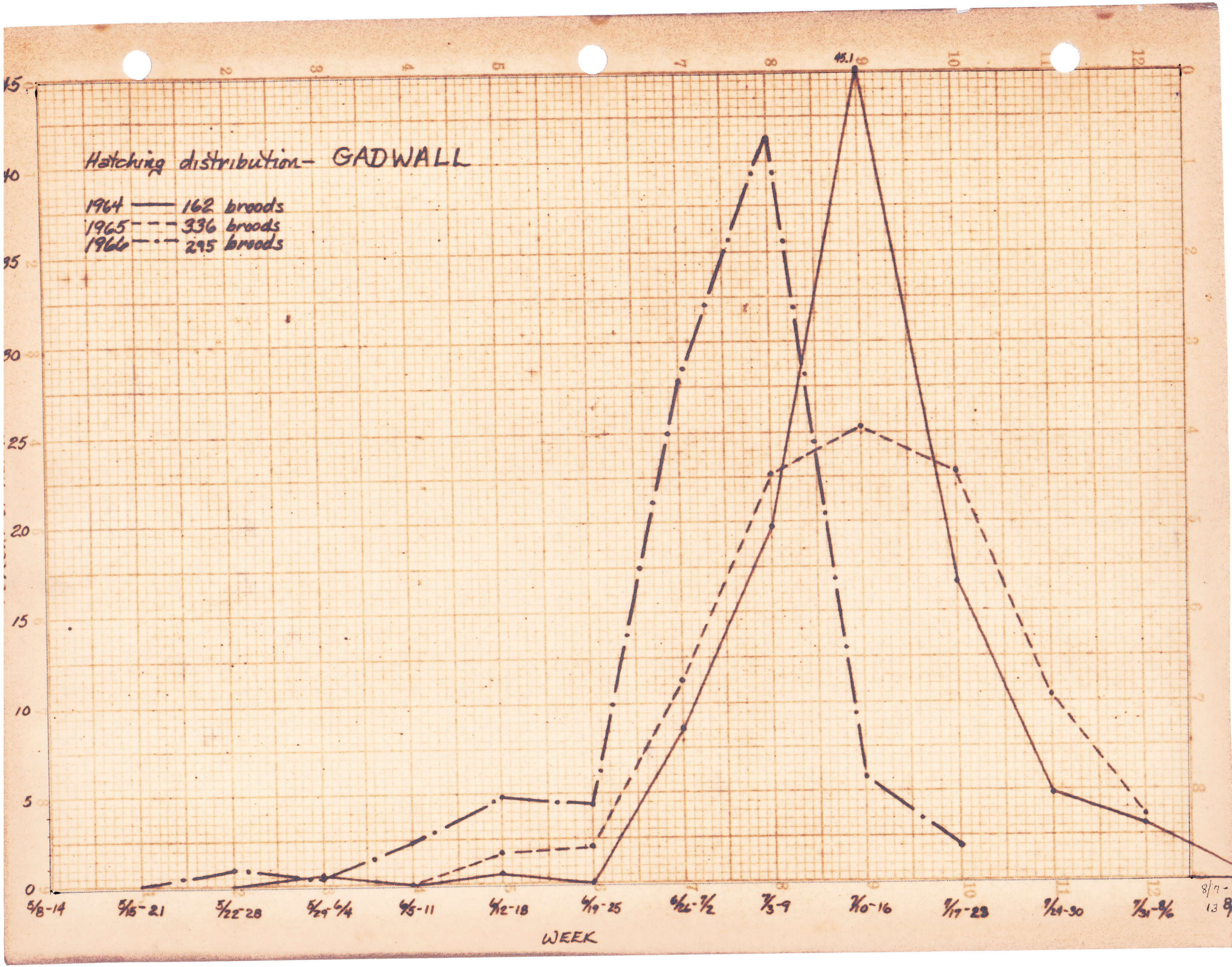
Malheur National Wildlife Refuge

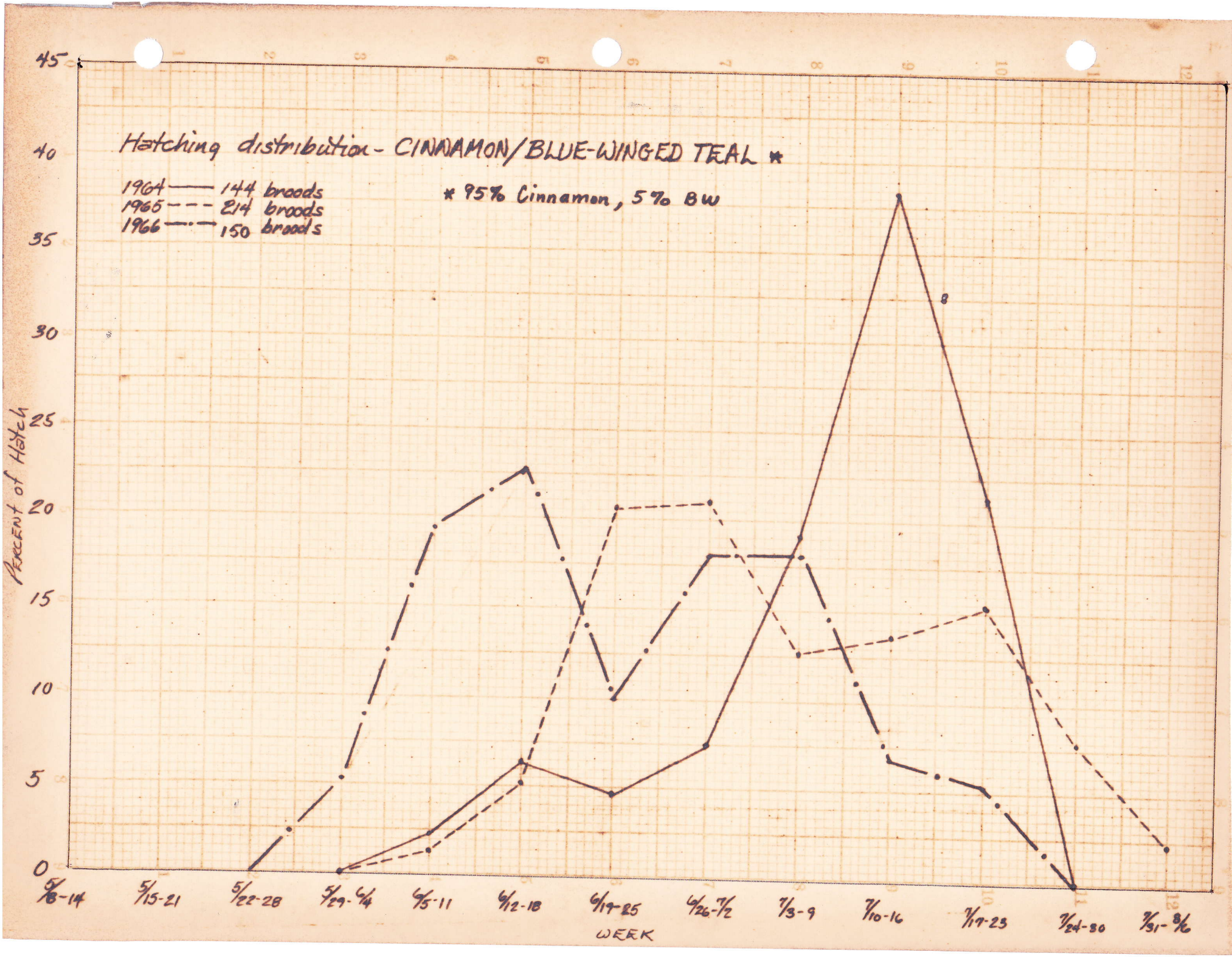
Table 4. Summary of average duck brood sizes, 1964, 1965, 1966

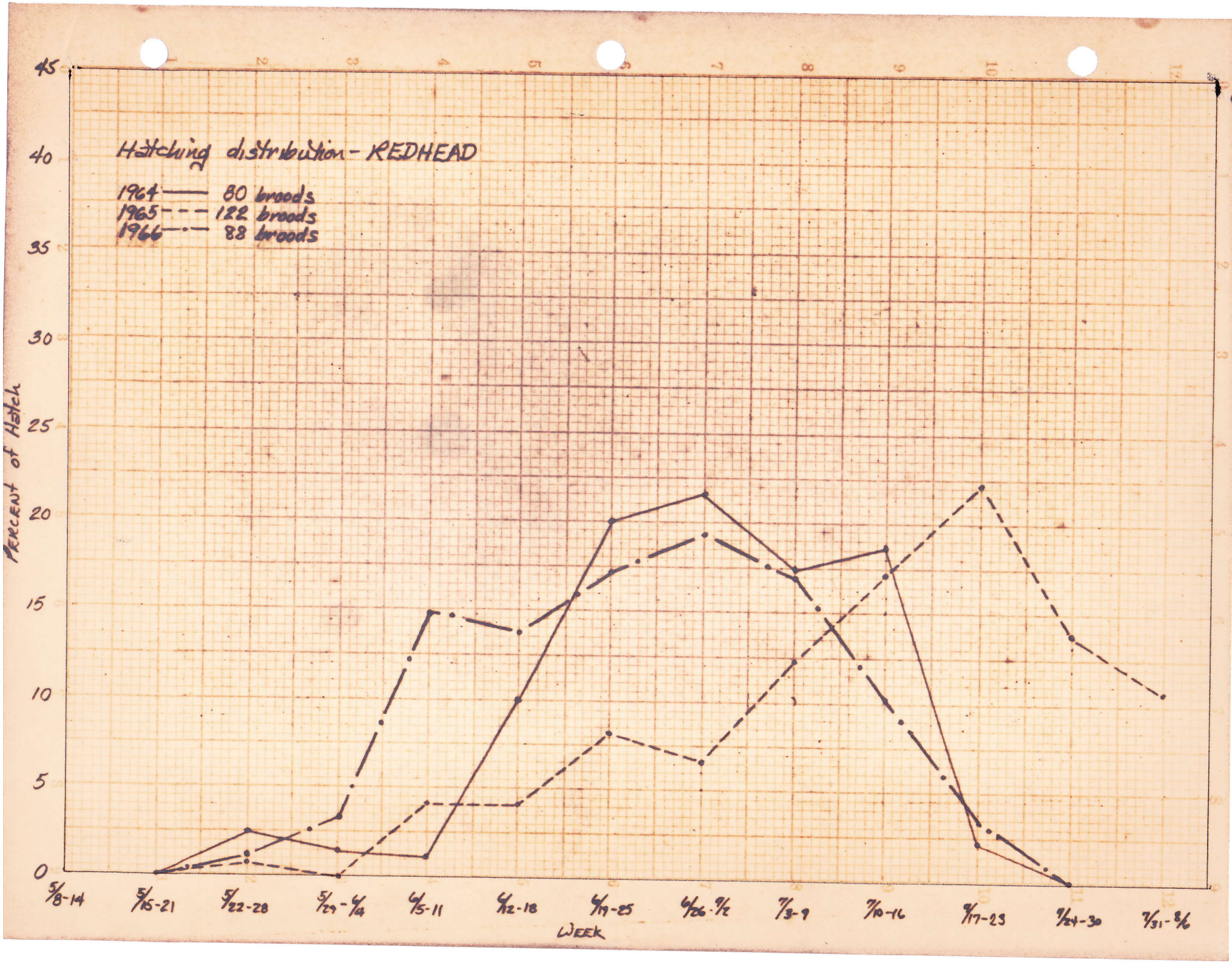
Species	Age Class	1964	1965	1966
Mallard	I	7.3 (27)*	6.4 (33)	5.4 (20)
	II	8.3 (12)	6.4 (45)	6.1 (72)
	III	7.5 (41)	5.4 (40)	5.2 (101)
Gadwall	I	8.3 (83)	8.1 (150)	7.4 (170)
	II	7.7 (10)	8.0 (50)	6.6 (54)
	III	—	—	4.0 (4)
Pintail	I	7.3 (10)	4.0 (2)	6.0 (3)
	II	5.4 (5)	5.7 (12)	4.4 (5)
	III	—	5.6 (9)	3.8 (6)
Green-winged Teal	I	5.5 (4)	8.5 (2)	5.0 (1)
	II	—	7.6 (10)	3.3 (4)
	III	—	9.0 (2)	—
Cinn./B.w. Teal	I	7.8 (57)	6.6 (49)	6.1 (35)
	II	7.0 (16)	7.6 (80)	6.1 (45)
	III	14.0 (1)	7.2 (32)	6.2 (42)
American Widgeon	I	6.9 (22)	8.0 (29)	7.1 (15)
	II	7.3 (3)	7.2 (5)	5.4 (11)
	III	—	—	—
Shoveler	I	5.7 (10)	6.5 (6)	6.5 (2)
	II	5.5 (2)	8.3 (6)	6.8 (6)
	III	—	4.0 (1)	4.0 (1)
Redhead	I	6.4 (46)	7.2 (60)	5.2 (34)
	II	6.4 (16)	6.6 (19)	5.4 (31)
	III	—	—	7.0 (1)
Ring-necked Duck	I	—	8.0 (1)	—
	II	—	—	—
	III	—	—	—
Canvasback	I	9.3 (4)	6.1 (21)	3.5 (21)
	II	4.0 (3)	5.6 (13)	3.4 (45)
	III	4.0 (1)	—	3.2 (5)
Lesser Scaup	I	5.2 (5)	6.0 (8)	7.0 (1)
	II	—	6.0 (2)	—
	III	—	—	—
Ruddy Duck	I	6.1 (13)	6.4 (27)	5.0 (7)
	II	—	6.6 (8)	2.8 (12)
	III	—	—	4.0 (4)
Common Merganser	I	—	—	8.0 (1)
	II	—	—	21.0 (1)
	III	—	—	15.0 (1)

* Parentheses enclose the number of broods considered in computing brood sizes.


Hatching distribution- MALLARD
1964 —— 82 broods
1965 - - - 153 broods
1966 —·—·— 291 broods
Percent of Hatch
45
40
35
30
25
20
15
10
5
0
5/8-14
5/15-21
5/22-28
5/29-6/4
6/5-11
6/12-18
6/19-25
6/26-7/2
7/3-9
7/10-16
7/17-23
7/24-30
7/31-8/6
WEEK


Hatching distribution- GADWALL
1964 —— 162 broods
1965 - - - 336 broods
1966 -·- 295 broods
45.1
45
40
35
30
25
20
15
10
5
0
5/8-14
5/15-21
5/22-28
5/29-6/4
6/5-11
6/12-18
6/19-25
6/26-7/2
7/3-9
7/10-16
7/17-23
7/24-30
7/31-8/6
WEEK


Hatching distribution - CINNAMON/BLUE-WINGED TEAL *
1964 —— 144 broods
1965 - - - 214 broods
1966 —·— 150 broods
* 95% Cinnamon, 5% BW
PERCENT of Hatch
45
40
35
30
25
20
15
10
5
0
5/8-14
5/15-21
5/22-28
5/29-6/4
6/5-11
6/12-18
6/19-25
6/26-7/2
7/3-9
7/10-16
7/17-23
7/24-30
7/31-8/6
WEEK


Hatching distribution - REDHEAD
1964 —— 80 broods
1965 - - - 122 broods
1966 —·— 88 broods
PERCENT of Hatch
45
40
35
30
25
20
15
10
5
0
5/8-14
5/15-21
5/22-28
5/29-6/4
6/5-11
6/12-18
6/19-25
6/26-7/2
7/3-9
7/10-16
7/17-23
7/24-30
7/31-8/6
WEEK

2. Other Water Birds.

Although waterfowl had a rather bad year, most of the water birds and shorebirds enjoyed a good year. The water birds nesting in Malheur Lake established two colonies while there was only one for the past several years. The number of nests by egrets, cormorants and herons was greater than any time since 1958. A comparison between nest estimates in 1965 and 1966 is shown below. Locations of major water bird nesting colonies are shown on the accompanying map.

Species	Nests in 1965	Nests in 1966
Double-crested Cormorant	30	125
Great Blue Heron	50	200
Common Egret	200	400
Snowy Egret	20	50
Black-crowned Night Heron	250	600
White-faced Ibis	5	10

Pelicans did not nest this year, but larger numbers used the refuge from May through August than for several years. A population of up to 6,000 was present during most of July and August, in comparison to a peak number of only 500 in 1965. One of the most spectacular sights was the presence of up to 500 pelicans on Sod House Pond at refuge headquarters during July. This is a small pond about 200 yards across and within a short distance of the office and residences. The pelicans were feeding upon small fish, mostly shiners, which were very numerous in the pond this year.

More white-faced ibis used the refuge during the fall months than for several years. Up to 500 were here in September and October.

Production by eared grebes and pied-billed grebes was considerably lower than in 1965, but Western grebes nested in greater numbers. The largest eared grebe colony in Malheur Lake was in the southeast portion of the center section and contained

about 1,000 nests. Western grebe nesting was about equally distributed throughout the lake, but most was in the center section.

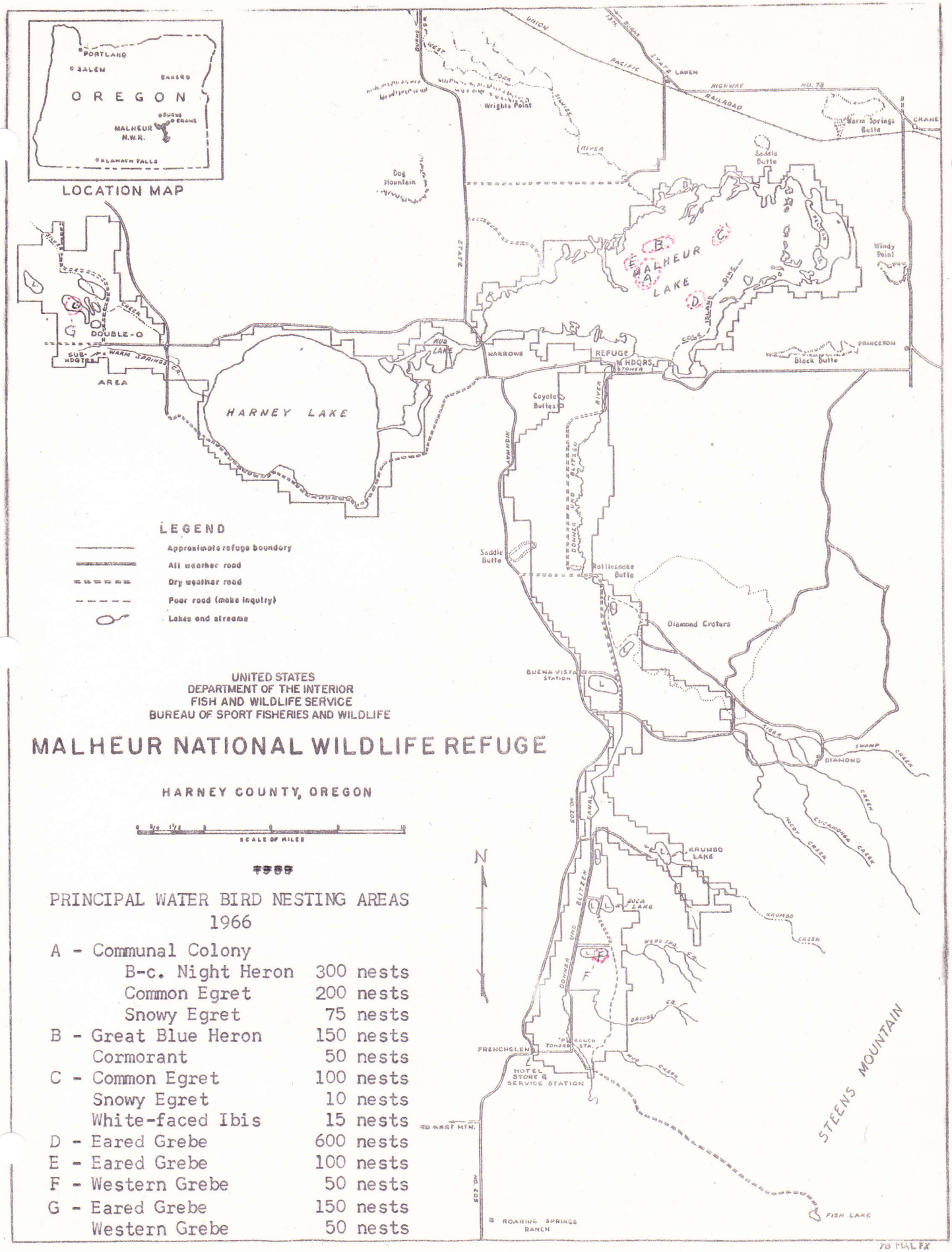
Increased activity by fish-eating birds this year appeared to be correlated with a corresponding increase in fish populations, especially carp.

Sandhill crane production was lower than normal due to the poor water conditions in the Blitzen Valley, their preferred nesting area. The first crane was seen on February 19, about the average date and numbers had built up to about 500 by mid-April. Migrating birds increased the population to about 1,000 during April and by mid-May the population was again about 500. Fall migrants began arriving about mid-September, with a considerable influx on September 24 and 25. By mid-October, the refuge was host to about 3,500 cranes. Most of them were concentrated about the Knox and Buena Vista grain fields and along the north side of Malheur Lake.

The refuge has the good fortune of having a graduate student from Colorado State University, Mr. Carroll Littlefield, conducting a two-season study of sandhill crane ecology here. Mr. Littlefield spent the summer here this year and will return again in 1967 to complete his field work. During his first season, he obtained a lot of information on behavior, nest site preferences and productivity. We were happy to have this study initiated in view of the fact that Malheur has the largest nesting population of greater sandhill cranes in the United States.

In early fall, we captured, banded and color-marked 26 cranes to obtain information on wintering ranges and to allow Mr. Littlefield to recognize individual birds next year. The birds were captured with a cannon-projected net (one-inch mesh with "skirts") fired from vertical railroad ties elevated three feet above ground. This has proved to be a safe and effective way to capture these large birds. None were killed or injured during the operation. The birds were banded with standard Fish and Wildlife Service bands on one leg and plain bands with one-inch by four-inch plastic streamers attached on the other. Subsequent observations indicated no aberrant behavior by or directed toward the marked individuals.

Kenneth Meservey, Mammal Control Trapper, reported observing an albino sandhill crane on the west side of Harney Lake near the Moon Ranch. He said the white bird was in a flock of 30 to 40 birds. He could not remember the exact date but knew the observation was some time in October.


PORTLAND
SALEM
BAKER
OREGON
BURNS
CRANE
MALHEUR N.W.R.
KLAMATH FALLS
LOCATION MAP
LEGEND
Approximate refuge boundary
All weather road
Dry weather road
Poor road (make inquiry)
Lakes and streams
UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
MALHEUR NATIONAL WILDLIFE REFUGE
HARNEY COUNTY, OREGON
SCALE OF MILES
PRINCIPAL WATER BIRD NESTING AREAS
1966
A - Communal Colony
B-c. Night Heron 300 nests
Common Egret 200 nests
Snowy Egret 75 nests
B - Great Blue Heron 150 nests
Cormorant 50 nests
C - Common Egret 100 nests
Snowy Egret 10 nests
White-faced Ibis 15 nests
D - Eared Grebe 600 nests
E - Eared Grebe 100 nests
F - Western Grebe 50 nests
G - Eared Grebe 150 nests
Western Grebe 50 nests
HARNEY LAKE
MALHEUR LAKE
DOUBLE-O
SUB-HDQTRS
AREA
WARM SPRINGS CR.
REFUGE HDQRS
NARROWS
Wright's Point
Dog Mountain
Saddle Butte
Windy Point
Black Butte
PRINCETON
Coyote Buttes
Rattlesnake Butte
Diamond Craters
BUENA VISTA STATION
DIAMOND
SWAMP CREEK
KRUMBO LAKE
BOCA LAKE
KRUMBO CREEK
FRENCHGLEN
HOTEL STONE & SERVICE STATION
STEENS MOUNTAIN
FISH LAKE
ROARING SPRINGS RANCH
78 MAL FX

3. Shorebirds, Gulls and Terns.

Many birds in this group are well known for their preferences for mudflat habitats. Especially conspicuous was the much greater nesting effort by avocets and black-necked stilts on mudflat zones of Malheur Lake. Greatest densities of these two species occurred in the area adjacent to Bat House Point, Cole Island, and the Juncus Ridge about half-way between Cole Island and Pelican Island. A census of one-square mile along the Juncus ridge on June 7 revealed a breeding population of 125 avocets and 20 black-necked stilts.

Nesting by willets and long-billed curlews appeared to be less than in 1965.

About 100 pairs of Franklin's gulls and 50 pairs each of ring-billed gulls and California gulls nested this year. The Franklin's nested in one colony in hardstem bulrush near the center of Unit 5 in Malheur Lake and the ring-billed and California species nested on small disconnected portions of Cole Island Dike north of the Red Cabin.

Average numbers of Forster's terns and black terns nested in the center section of Malheur Lake and in Derrick Lake at the Double-O. A few Caspian terns were seen in June, and one in October. Forster's terns were showy in their fishing activities over Sod House Pond in July, when up to 100-150 could be seen at one time.

4. Doves. No systematic survey is conducted for doves here, but general observations suggested that the nesting and migratory populations were about normal.

B. Upland Game Birds.

For the first time this year, a standard crowing cock pheasant census was conducted. One route (May 5) was along the Center Patrol Road between Page Dam and Witzel Lane (Krumbo Lake Road). Along this route, a total of 63 calls were heard in 7 stops, an average of 9 calls per stop. The second route (May 6) was also along the Center Patrol Road from Diamond Lane to refuge headquarters. On this route, 106 calls were heard in 11 stops, an average of 9.6 calls per stop. Counts were begun one-half hour before sunrise. Stops were made every two miles and calls heard during two minutes were recorded. Assuming that all male pheasants crowed once during the two minutes, calls could be heard for one mile and the sex ratio was approximately two males per female, the pheasant population in Blitzen Valley in the spring of 1966 was approximately 25-30 birds per square mile. Reproductive success for pheasants was good this year.

California quail populations were again good this year, but reproductive success did not seem to be as good as in 1965. Populations of sage grouse and chukars remained low; but observations of grouse were more common. One gray partridge was seen near Buena Vista on June 29, for the first confirmed observation of this species since 1961.

Records of wildlife not mentioned above are presented on the appropriate NR forms.

C. Big Game Animals.

Population size and reproductive success of mule deer, the most abundant big game animal on the refuge, was similar to recent years. The main fawning period was the first half of June. Many sets of twins were seen, attesting to the healthy population status of the species. During the archery season, hunters complained about the scarcity of bucks. Just a few days before the season, a herd of 25 deer was seen at the edge of Boca Lake with several good-sized bucks among them. This area was hunted by several parties during the season, but none of them scored.

Pronghorns are never abundant here, with most observations being along the north side of Malheur Lake and in the north end of Blitzen Valley. The adult male which had been in our enclosure at headquarters was transferred to the National Bison Range. That leaves only two yearling bucks in the enclosure, which continue to attract a lot of attention from visitors.

D. Fur Animals, Predators, Rodents and other Mammals.

The upward trend which began in the Muskrat population in Malheur Lake in 1965 was short lived as a result of lowered water levels this year. Very few new lodges were seen, and the area of highest population densities in the west end of the lake went dry by August.

Raccoons continue to be abundant and signs of heavy use was noted around many mudflat-ringed ponds during the summer. During the fall, intensive activity was noted along stream banks and especially where shellfish were abundant. Undoubtedly, raccoon are hungry as quite often they are observed either singly or in groups up to five wandering in search of food during the day. Garbage cans are visited nightly. The Allied Company buckaroo boss was recently telling about his raccoon observations. He reports that they were quite commonly observed all during the summer along streams on Steens Mountain. He told of riding by an old carcass out on the desert in the south

end of Catlow Valley and out of the corner of his eye caught some movement. Upon examination it was found that the decaying carcass had a hole in the brisket and a raccoon was using it for a home, as well as subsistence.

Observations of mink and beaver during the year were limited to a few in the Blitzen Valley and Double-O. Coyotes added to the environmental scene by their presence and vocal activity. This is a species which invariably invokes great emotion among visitors to the area, attesting to the fact that there are few places where they can be seen and heard. The numbers all over the country were much greater this year. As many as twelve were seen in one pack. One rancher reported the loss of twenty-six known calves in his fields and it was only after he secured the services of a plane hunter that he got relief. Eight coyotes were shot among the cattle one morning and three a few mornings later. There was no question as to their hunger as rodent populations are low, A Shetland pony killed on the highway near the Narrows late one evening was completely devoured by morning with only a few bones remaining.

An interesting observation was made by Refuge Manager Scharff and County Judge Hotchkiss the latter part of December on the road to Hart Mountain. About two inches of new snow was on the ground having fallen along toward morning. A couple of birds were noted rising out of the sagebrush about a hundred yards from the road and an examination disclosed quite an act. From the tracks it was determined that seven coyotes descended upon the eighth and decided to devour him. The first time he was caught he broke away but didn't go far until he was overhauled. The second time, he got away but left a little blood on the snow. The third time, he was killed and the fresh blood was spewed over an area of fifty feet radius. He was completely devoured with the exception of the two front feet and they were still soft and pliable, indicating that the deed had just been finished about the time we drove up. Indications were that our arrival disturbed the coyotes as their tracks were observed running away in the sagebrush.

Another testimonial to the fact that the coyotes are hungry is the manner in which 1080 stations were devoured when they were placed. Usually, it is several days or weeks before coyotes start working on the stations, but this year a number of baits were completely consumed within a few days from the time they were put out.

The mammal control trapper accounted for 87 coyotes, 26 bobcats, 21 raccoons, 4 feral house cats, 7 badger, and 4 porcupine on and immediately adjacent to the refuge. A number of shooting permits

were issued permittees for coyotes where they were causing damage and these accounted for an estimated sixty coyotes. Private trappers along the edge of the refuge caught a considerable number during the early fall, but quit quite early because of the low price being offered for coyote pelts. In spite of the heavy harvest, coyotes are still numerous on and about the refuge.

Bobcat numbers are low, but occasionally one is observed along the road or canal bank.

Badgers were occasionally seen over most of the refuge and during the late fall one spent a month or so digging squirrels in the vicinity of the Sod House Dam. He became quite popular with photographers and school kids. An unusual observation on July 20 was a badger swimming across George Lake, a distance of over 200 yards.

All species of rabbits continue to be relatively low in numbers.

No large populations of any small rodents were noted, although a little sign of Microtus and Peromyscus are common throughout the area.

E. Hawks, Eagles, Owls, Crows, Ravens and Magpies.

In common with the preceding categories, we have no precise measurement of populations of birds in this group.

Bald eagles appear to be less numerous than a year ago. Twelve were observed on the December 14 aerial census, but few ground observations have been made. Probably not to exceed fifteen or twenty are wintering on the refuge this winter.

Nesting of golden eagles appeared to be about the same as a year ago, but there continues a downward trend in numbers. Gary Hickman, Wildlife Biologist, Division of Wildlife Services, Boise, Idaho, in company with Tim Nelson, surveyed the eagle situation in the vicinity of the refuge. They located twenty golden eagle nests, five of which had eaglets. The rest were either inactive or alternates.

Another interesting raptor observation was made at the refuge headquarters late last winter. A prairie falcon had moved in and taken over the observation tower for a perch. During its month or six weeks stay, it often tantalized other birds and naturally took some for food. For some reason, it had a pet peeve against great horned owls. One day at noon an owl was flushed out of a

spruce tree. It hadn't more than gotten into the open when the falcon appeared from above and forced it to the ground. It dive bombed the owl a number of times, but didn't actually strike it. Several of the refuge personnel were observing it at this time. Finally, the falcon returned to his perch. When the owl decided to again move, he hadn't flown more than a hundred yards when the falcon struck it in the back of the head, knocking it to the ground and apparently killing it. Manager Scharff was gasing his car nearby and walked over and picked up the owl by a wing and decided it was dead. In returning to the office he mentioned the episode to Del Pierce and suggested that Del get the owl for a specimen. When Del arrived to get the owl, he was sitting up blinking his big eyes and once more took off. At about two hundred yards, the falcon again knocked him to the ground. It appeared that the show was repetitious so everyone quit watching.

The following golden eagle observation was made by Refuge Manager Scharff:

> The evening of October 16 I found a three-point mule deer which had been shot on the refuge by some passing hunter and the birds and one coyote had apparently just found it. The next morning, shortly after daylight, I paid the spot a visit and saw one of the greatest sights I have ever observed. There were seven coyotes, five golden eagles and a large number of ravens and magpies near the carcass. One large mature eagle was perched on the carcass eating his fill. It was quite evident that he enjoyed complete control. The other four eagles were perched on the ground and nearby fence posts and three coyotes were sitting about twenty feet away, drooling for the chance to get at the feast. An occasional raven and magpie darted in for a morsel but didn't remain long. My arrival disturbed things and all present became wary and began to disperse. The large mature eagle remained until the other animals and birds mostly left and it was quite reluctant to relinquish its position. His leaving was the sign for the magpies and they immediately swarmed in from all directions for a feed. That evening, a visit revealed little left of the deer but part of the rib case and head. Only a few magpies remained cleaning up.

One rare peregrine falcon was observed on December 31 during the Christmas Bird Count.

Marsh hawks continue to be the most abundant species of hawk, but for winter this year the rough-legged hawks are running a close second in number. One interesting observation of the roughleg is a melanistic bird that has been wintering in the same vicinity of the refuge for the past three winters. Usually it is one of the early arrivals and this year was no exception.

Generally, the great horned owl population seems to be down. Likewise the short-eared owl. Burrowing owls enjoyed a good season with nests in evidence over the entire refuge.

The owl nest located just to the rear of the Manager's residence again produced two young. One, in learning to fly, tried an electric transformer for a perch and was electrocuted. The other one had the misfortune to break a wing. He was placed in a cage and fed rabbit. Shortly after this episode, a neighboring rancher found a mature owl that for some reason couldn't fly, although he had no apparent injury. He, too, was placed in the cage and the two owls spent most of the summer dining on rabbit and entertaining the public. Upon being liberated, the young owl seemed to have good use of its wing and left in a short while. However, the old owl for some reason just couldn't fly over a hundred feet or so. For a couple of weeks he remained about the headquarters and had a favorite place on the wall behind the manager's house to come and snap his bill and demand food. Whenever he came a rabbit was killed for him and after having a good feed he would disappear for a time. He finally failed to show and we never knew whether he improved to where he was able to provide his own food or whether he perished.

Populations of predaceous ravens and magpies appear to be on the upward trend. They too appear to be hungry as any source of food attracts sizable numbers.

F. Other Birds.

We have nothing of significance to report in this category. The Christmas Bird Count was conducted on December 31 and about 3,805 individual birds of 50 species were observed. There appeared to be a noticeable dearth of small birds. Two observations of interest were the peregrine falcon and goshawk. The count was down in both species and number from a year ago. Another record of note was the chestnut-sided warbler captured in a mist net on June 21.

G. Fish

Krumbo Reservoir became saturated with roach this year and had to be drained and poisoned. From the beginning of trout season on April 23, Krumbo fishermen complained about catching dozens of roach and only an occasional rainbow trout. In May we opened the gate and the lake began to drain. The water elevation had dropped about seven feet and the remaining depth was about 12 feet in mid-June.

State Fisheries Biologist Larry Bisbee sampled the fish population with gill nets and trap nets June 17 to see if trout numbers were high enough to warrant a no-limit season before the reservoir became dry. The nets yielded 1,655 four to eight-inch roach; 74 trout, all but ten 12 inches or under and a few small shiners. Mr. Bisbee felt that with this population ratio there would be little point in having a no-limit season because it would probably be difficult to catch even a few trout.

Except for a few pools and springholes the reservoir was dry by late September. We rotenoned all remaining water areas including about three miles of Krumbo Creek the last week in September. Although the kill was good, it is impossible to reach all the fish in springholes. Many fish receiving a small dose of rotenone push against the sides of the holes and benefit from the fresh water coming out. No amount of stirring, dynamiting or other agitation seemed to force all of them out into the poisoned water. The appearance of tiny one-inch fish about two months after the poisoning was another disappointment. Rotenone is supposed to kill fish eggs, but apparently it didn't get all of them. Although follow-up treatments killed many of the newly hatched fish, the reservoir was partially refilled by this time and contained too much water for full-scale poisoning. It appears highly probable that we will have to drain and poison the reservoir again in a very few years if we are going to maintain a trout fishery.

Five-Mile Spring and portions of the Warm Spring Canal were treated with rotenone for carp control three times this fall. Good apparent kill was obtained, but there always seemed to be a few escapees. The first poisoning killed about 30 pumpkinseeds, several hundred carp over three inches and several thousand under three inches. Each of the follow-up treatments killed several dozen three-inch to twenty-inch carp and several thousand newly hatched carp about an inch long. As with roach eggs, it appears the rotenone did a poor job at killing carp eggs.

The reason for poor fish egg kill in Five-Mile Spring and the Krumbo Springs may have been that the eggs were laid in moving water. An apparent 100 per cent kill was obtained on carp and their eggs in the few isolated Blitzen Valley ponds treated with rotenone.

Drouth conditions on Malheur Lake and water impoundments in Blitzen Valley resulted in a great deal of natural carp control this year.

Boca Lake, closed to fishing, normally serves as a sanctuary for brood trout. The large trout in the lake leave by way of the East Canal to spawn in Bridge Creek. Fish produced provide most of the angling for Bridge Creek and the East Canal. Because the lake became very low and stagnant this year, we may have lost most of our brood fish. As a result, angling success will probably be lower.

Rainbow trout fishing in the Blitzen River, Bridge Creek and the East Canal was good in 1966. The Blitzen River which receives most of the refuge's angling pressure yielded good catches of stocked fish averaging about 11 inches. A few fish in the 24-inch or over size class were taken also.

The Blitzen River received two fish plantings in 1966, both from the Hagerman National Fish Hatchery. Four thousand rainbows were planted April 7; 2,150 planted June 27. Both plantings consisted of ten-inch to twelve-inch fish.

About 1,000 fish in the first load were dead on arrival. Only one fish in the second load was dead. On the first load the hatchery, experimenting with a new truck, was testing the maximum carrying capacity. Apparently 4,000 fish were too much.

H. Reptiles and Amphibians. Little information was obtained on the reptiles and amphibians of the refuge this year. A number of visitors to the refuge looking for rattlesnakes didn't have much luck in finding them. Most everyone kills rattlers and they are becoming fewer in number each year. A neighboring rancher was telling how he preferred a large rattlesnake to a house cat for keeping the mice out of the house where he stored his grain and meal. He said he made the mistake of putting a large blow snake in with him for company and the rattlesnake left in short notice.

I. Disease. No significant mortality from this cause was noted in 1966. A few dead ducks were observed, but probably not more than 100 all year.

III. REFUGE MAINTENANCE AND DEVELOPMENT

A. Physical Development.

1. Restoration of Roads, Bridges, Fences, Dikes and Structures.

Sixteen and one half miles of the Center Patrol Road, from two miles south of the refuge headquarters to Grain Camp Dam, were surfaced with cinders under contract. In addition, the Skunk Farm Road of almost a mile and a half was included in the contract. Refuge personnel and equipment placed the grade in condition for surfacing, provided turnarounds for the hauling equipment and installed the drainage. An average of 40,000 gallons of water was hauled daily for use in processing the surfacing materials all during the hauling period. One and a half miles of the roadbed were partially relocated and rebuilt, which provided for an improved alignment.

Another segment of the Center Patrol Road was rebuilt and widened for a distance of a little over two miles by refuge personnel and with refuge equipment. Assistance was rendered by Job Corps in hauling and processing nine thousand yards of cinders on this piece of road. For the first time since the Center Patrol Road was constructed under the CCC program in the late nineteen thirties, it can now be traveled all times of the year and during periods of wet weather. It certainly is a boon to refuge travel and especially during the water season when so much travel is required in regulating the various water control structures. Visiting groups will appreciate this improvement as during inclement weather much of the Center Patrol Road could not be negotiated.

Two refuge bridges that were severely damaged by the flooding conditions in late 1964, and only partially restored by the refuge, were replaced with cement and steel structures by the Bureau of Land Management during the past year. The refuge contributed some labor and equipment work in the installation of the cement abutments. While this improvement is on the refuge the road is important to the BLM as it provides access to one of the more important summer grazing areas of the local District and furnishes ingress and egress to the most important recreational area in Harney County. Some thirty thousand cubic yards of fill materials were required in the earth approaches of the bridges.

The Darnell Pond dike in the P-Ranch unit of the refuge was repaired with riprap and graveled surface over the damaged area.

Gravel was hauled for the repair of a number of bridges in the P-Ranch area, mostly on the Center Patrol Road.

Four miles of the Warm Spring Canal in the P-Ranch unit were cleaned and rebuilt. This is the first time that the upper end of this canal had been cleaned since construction, over twenty-five years ago, and was much needed. The canal was cleaned and straightened, willows removed from the bank in places, checks repaired where needed, fence crossings rebuilt, water gaps renewed and a good general overhaul was accomplished. Four miles of minor laterals were cleaned in connection with the above job and checks rebuilt and restored where required. Owing to the continued lowering of the river bed in the upper Blitzen Valley and the rapidity with which the water flows in canals and laterals, it is a continuing effort to maintain the water on the surface of the ground and preclude the cutting of deep eroded channels.

A new structure was provided under contract from the East Side Canal to enhance serving a large area of irrigated meadows and ponds. Previously, a large acreage of this unit received water from two diversions of the river that now only function in a limited manner when the river is at normal or low stage. In connection with the diversion, fifty-six hundred feet of lateral was constructed with a number of checks and turnouts. This lateral has a three-foot bank, is eight feet in the bottom and all but eight hundred feet of the fill was provided with Cats and cans. It will require a couple of years to get this new development properly working, but it will be a boon to those distributing water in this section of the refuge. Borrow areas for this project were smoothed and seeded to a grass and legume mixture late in the fall.

Outside of many miles of fence repair over the year, construction consisted of five and three fourths miles of new boundary fence on the Malheur Lake Unit and almost half a mile in connection with the cleaning of the Warm Spring Canal. One and three fourths miles of new interior fence were provided where an electric fence had been used for a number of years. Some seven miles of old fence were razed and cleaned up.

Last summer while visiting a ranch in northeast California, it was noted that a large mileage of fence, both on the ranch and on the summer range, was constructed of four wires with posts at one hundred feet intervals with four metal stays between the posts. Considerable discussion was had about this fence and it was found that this particular rancher had over thirty miles of this type of fence which included his winter bull lot. He stated that they

had been using it for years with equally as good results as the conventional fence of one rod posts and two stays between. He further mentioned that in the snow country where it had always been necessary to spend a lot of time each year repairing broken wire resulting from the snow, since adopting these specifications not a single wire had been broken by snow. The costs in both labor and materials had been reduced by half. As a trial, five miles of boundary fence and one and three fourths miles of interior fence were constructed to these specifications. Two men were able to construct a quarter mile per day and lots less expense was involved in materials and distribution costs. It would appear that this type of fence could well be adopted on a lot of refuges and especially areas that are subjected to heavy snow and antelope movement. A single animal or a band could readily and rapidly pass under this fence between posts without damage to either the fence or the animal. It would appear to have a large place in the refuge fencing program and we hope to have a further report on this project another report time.

A number of permanent cannon net sites were selected and graveled and sanded for clean places to make the catch. These sites worked admirably with no muddy birds to handle, clean places for baiting and no debris to get in the way of the net.

Approximately three hundred feet of the display pond dike was riprapped and graveled. Considerable damage was being done to the bank by the bird use and water action. This was a much needed improvement.

During the CCC program an old storage yard accumulated a lot of materials and salvaged things which had been allowed to grow up in grass and greasewood and was not only unsightly but created somewhat of a hazard. During the winter this yard was cleaned up, with all old unserviceable materials and things being burned or buried. Anything that would make wood was sawed for use in the recreational business. Good materials were sorted and repiled. The yard now presents a neat appearance and one can find things that were not known about by some.

One 43⅓-foot single-span bridge was constructed over the Blitzen River near the refuge headquarters under force account. This new structure replaced a piling bent bridge that was built thirty years ago. A pile driver was rented from the County for driving the abutment piles. The deck on this bridge was raised, which required a considerable amount of gravel for filling purposes.

A similar bridge was constructed under contract at Five-Mile, also crossing the Blitzen River. Considerable saving is effected by doing such work under force account. Personnel ceilings seriously govern the number of such projects that can be undertaken, however.

Two separate contracts were let for the rental of two D-8 tractors and one D-7 during the fall and eighty potholes were constructed in the upper part of the Blitzen Valley. Observations of the potholes constructed a year ago is indicative that brooding ducks will derive a distinct benefit from such improvements. Undoubtedly a much larger percentage of young ducks will reach maturity in areas that have potholes over the vast flats that dry in a short period of time.

In connection with this project, minor repairs were made to existing improvements in the units worked. In the Bridge Creek vicinity one fine small goose nesting area was developed with good control of the water and a number of islands constructed. A number of islands were shoved up in the Benson Pond. good

A little over two hundred acres of land was refuge farmed at Knox Swamp. Sixty-four acres were seeded to barley and 152 acres to wheat. The barley suffered real damage from the August freeze. While some use by waterfowl was enjoyed, none of the barley was satisfactory for harvesting. The wheat was a little more advanced and while it sustained some damage a considerable acreage was suitable for harvesting.

The usual road maintenance, distribution of water and maintenance of structures and fences were accomplished.

Job Corps accounted for considerable refuge improvement over the year. Ten and a quarter miles of new fence were built and three fourths miles of old fence razed and cleaned up. One and one half miles of road were constructed and surfaced. Two 24-foot cattle guards were installed in connection with this road. Two miles of road were surfaced with cinders in cooperation with refuge personnel and equipment. Five miles of roadside and river bank were cleaned of dead willows and debris which added much to the appearance of the road and river channel. The large 150-foot storage building at Buena Vista was scraped and given two coats of paint. The roof was treated with shingle stain. Forty-five hundred cubic yards of rock were crushed for road and cement work. Assistance was rendered in boundary survey work and the Narrows cemetery fenced and headstones restored. At the close of the report period, the Double-O entrance road was being worked upon and will be one

of the major refuge projects of the winter. Exclusive of the work accomplished so far on the Double-O Road, the appraised value of the completed projects on the refuge over the past year is $48,500.

In addition to the work performed on the refuge by the Center, similar accomplishments were made for the Bureau of Land Management and the Community.

2. Repairs to Equipment.

In addition to the normal maintenance and minor repairs, both in the shop and in the field, the following major repairs to equipment were accomplished:

Five thousand mile inspections and tuneups were made on twenty-five vehicles during the year.

A major overhaul was given the D-4 tractor consisting of new steering clutches, brakes, master clutch, pressure plate, rebuilt water pump, radiator repaired and new cutting edge provided on dozer blade.

A complete engine overhaul was performed on the D-7 tractor consisting of new liners, pistons and rings, rod bearings, reworked valves in cylinder heads, new injection nozzles, stabilizer spring saddle and new oil pan. One new final drive sprocket was installed and master track pins replaced. Grouser bolts were replaced where required. Clutch on the rear power control unit was relined and new brake bands installed.

On Koehring Dragline No. 1, broken boom was repaired, bearing replaced on swing and traction shaft, and the bucket given a major overhaul consisting of new runners, wear plates on back corners, and new pins. Worn teeth were built up and hard-faced and shanks repaired.

Considerable work was required to repair the Adams motor grader. A new input shaft and seals were installed in the auxiliary transmission. A new rebuilt fuel injection pump with new injection nozzles was provided. Reworked brakes and a major overhaul was performed on the motor. A new paint job was given this machine.

A new rear axle housing and necessary rear end parts were provided in the Ford 4x4 pickup.

A new ring gear and pinion gear with carrier bearings, pinion bearings and necessary seals and gaskets were placed in one of the Chevrolet pickups.

In one of the Studebaker pickups a rear axle housing and axle bearings were installed. New brakes were installed replacing the broken assembly.

The old Hercules Diesel motor was removed from the Bay City mobile crane and replaced with a rebuilt 1673 Caterpillar truck engine. This unit was given a major overhaul. A new radiator and shutter, tachometer, oil pressure, fuel pressure and temperature gauges, glove plug and starter switch were installed. A bracket was made of angle iron for radiator support and a guard provided over the front of the radiator core. A boom rack was provided for supporting the boom when traveling. This is one of the most useful pieces of equipment on the refuge and it now should be in shape to last a number of years.

On the D-8 Cat the transmission had to be removed and master clutch replaced, as well as some chipped gears. Necessary bearings, sleeves, seals and gaskets were replaced where required.

Trailer hitch bumpers were installed on three new pickups and steel diamond deck plate was provided over the pickup bed floors.

New pressure plates and clutches were installed in two old International Dump trucks. New king pins and bushings were provided on two dump trucks.

One hundred eighty service jobs were performed on government equipment in the shop during the past year.

3. Building Repair and Carpenter Shop Activities.

A new rear porch was constructed and glassed in on the Double-O residence. This building is so situated that the prevailing Northwest winds invariably wrecked the rear storm door into the utility room. With the addition of the porch and the door hung in the opposite direction, this condition was overcome. The enclosed porch assists materially in reducing the amount of mud tracked into the house in this alkali area.

The P-Ranch bunkhouse was renovated by masonite on the walls, new linoleum on the floor and a coat of interior paint.

A new storm door was installed on the P-Ranch dwelling. The later installation was in a fashion that it is hoped that the wind cannot wreck it as has happened heretofore.

The lower section of one of the shop doors was replaced, new glass panels were installed in all three overhead doors, a section of the gutter was replaced, and the doors and casing given a new coat of paint. The installation of glass panels in the doors not only provides additional natural light in the shop but adds a measure of safety to those working in the shop.

The front porch on the Manager's residence was glassed in. This was a much needed improvement as it now makes this portion of the residence usable. Heretofore, it was a dust catcher. The addition of the glass adds much to the warmth of the north end of the building as the prevailing cold wind comes from that quarter.

In addition to the above major jobs performed, a multitude of small maintenance items were taken care of. New refrigerators were installed in three of the residences. A number of new directional and informational signs were made in the shop. Furnaces were repaired and adjusted. Odds and ends of painting were done. New ballast for fluorescent light in Museum show case installed.

4. Miscellaneous. To bring all buildings on the refuge to a desired standard of wiring, the Manager's residence and two of the Rome dwellings were rewired throughout.

B. Plantings.

1. Aquatic and Marsh Plants.

No aquatic planting was undertaken this year.

2. Trees and Shrubs.

A considerable amount of replanting was done at the Job Corps Center. The planting at the Center a year ago was a little ahead of the irrigation system and much of it will have to be replaced when water becomes available.

Plantings about the refuge headquarters consisted of a number of mountain ash and aspen, a row of forsythia west of the shop and a dozen pyracantha about the Museum and with the row of forsythia. Pryacantha were planted at the Double-O, P-Ranch and Buena Vista Stations as well as a number of mountain ash.

3. Upland Herbaceous Plants.

Numerous annual and perennial flowers were planted in the Headquarters area. The attractive results brought many complimentary remarks from refuge visitors.

4. Cultivated Crops. Owing to the dearth of irrigation water and rainfall the refuge Cooperative Farming Program was much less than normal. Cooperative farming only consisted of 340 acres of barley in the Mud Lake area and Buena Vista vicinity. The yields were light owing to frosts and the quality of grain harvested was poor. This same condition prevailed over the entire Harney Basin. Plantings were much below normal, the yield was short and quality poor. In addition to the cooperative grain farming, 135 acres were planted to oats in the East Grain Camp Field in lieu of planting a like acreage to alfalfa in the south end of the same field. The oats frosted and were utilized for hay. The alfalfa was spotty but with some replanting another year should result in a good stand. Excellent utilization was had of the alfalfa planting both by geese and deer during the late fall following the November rains.

The refuge seeded 64 acres to barley and 152 acres to wheat in the west Knox Pond. The barley was just right to be wiped out by the August freeze and while the wheat sustained some damage it yielded a considerable amount of grain. Twenty-seven hundred bushels of wheat were harvested and an estimated 1,000 bushels left standing. Seven hundred sixty bushels of barley were received from cooperative farmers and an estimated 820 bushels left unharvested. This is the second time in thirty-one years that the refuge has been short of grain.

Some grain will have to be purchased to properly feed the captive flock of birds and trumpeter swan, carry on the necessary banding program and make the necessary seedings another season. It is hopeful that 1967 will provided sufficient grain to once again fill all storage facilities and provide sufficient food for the migrations.

Twenty-nine acres of intermediate wheatgrass and yellow blossom sweet clover were planted on an old farming area from which Canada thistle had been eradicated. Owing to the lack of timely precipitation and irrigation water this seed didn't sprout. It may be that it will come later as crested wheatgrass seedings planted in the fall of 1965 and spring of 1966 failed to show, but this past fall made a good start. Seeding of pothole berms were also accomplished.

C. Collections and Receipts.

1. Seeds or other propagules.

No seeds or propagules were collected or received this year.

D. Control of Vegetation.

1. Canada Thistle.

Approximately 264 acres of Canada thistle were sprayed with Tordon 22K in 1966. Except for a few acres near the headquarters and Big Sagebrush Field areas, all thistle control work was south of Rockford Lane.

Equipment used for spraying was bean sprayers with handguns. This year, instead of mounting the bean sprayers on two-wheel trailers as we did last year, we mounted them on four-wheel drive vehicles. Maneuvering is easier this way and much time is saved.

A spraying program based on Tordon 22K seems to be the only solution to our thistle problem. We are reasonably satisfied with the results obtained so far and are convinced this chemical is the most effective thistle control product presently manufactured. However, two potential problems have arisen, one administrative and one biological, that could feasibly prohibit or cut down our use of Tordon.

The administrative problem is due to a recent regulation requiring a written waiver from GSA before a bid invitation can be issued. To obtain the waiver a statement indicating that the herbicides available under the recent Federal Supply Schedule will not do the job is required. We sent in the statement but a waiver was not issued because Mr. Geo. W. Ritter, Assistant Commissioner, Standards and Quality Control, wrote:

"If 25 lbs. per acre of 2-4-D are used, only one treatment is required to kill Canadian thistle which would cost approximately $13.00 per acre. In addition, 2-4-D is low in toxicity to wildlife and will not readily kill grass.

"In view of the advisability of adhering to an optimum quality standard for Federal Government herbicides, a waiver for the purchase of non-standard Tordon 22K cannot be granted."

We are particularly curious about the 25 lb. rate recommended by Mr. Ritter. The heaviest dosage manufacturer recommended is four to six pounds per acre. At present this procurement problem is still pending.

One representative from Dow Chemical Company informed us that the active ingredient in Tordon does not break down from natural

causes, or with the passage of time. If this is so, using the chemical year after year could seriously affect the ecology of an area, perhaps to the detriment of wildlife. The long-term stability and build up of a chemical as highly potent as Tordon might be particularly influential on a "dead end" water drainage system, such as in Harney Basin, that has no outlet to the sea. We would like to know more about this.

An important thought. I had not considered this

2. Other Vegetation Control.

Chemical application to other vegetation in 1966 included Tordon on a few small patches of morning glory in the P-Ranch and Buena Vista areas, 2,4-D amine on scattered patches of white top in the Buena Vista and Diamond areas and 2,4-D ester on burdock along Five-Mile Road and Warm Springs Canal.

E. Planned Burning.

No planned burning was undertaken the past year.

F. Fires.

Hazardous conditions prevailed over much of the late summer and early fall on much of the refuge. Four little lightning-caused fires occurred in the Blitzen Valley; but, as a result of quick action on the part of permittees and refuge personnel, the total acreage burned was held under four acres.

One storm starting three of the fires shattered twelve telephone poles -- one fire was at the base of one of the poles, one in a bunched hay field and the other in the middle of a patch of bulrush eight feet high.

Any of these fires could have been serious. Later, another fire from the same storm was found where the strike occurred, in a windrow of hay, and burned itself out at the end of the windrow. Just enough rain had fallen in that area to preclude the fire's spreading in the mowed stubble.

There were no man-caused fires this year. Use of the refuge during the most hazardous part of the year was quite heavy, but it appears that the programs of fire prevention are paying dividends.

IV. RESOURCE MANAGEMENT

A. Grazing.

The general outlook in the spring was rather bleak so far as forage was concerned over this part of the State. Grass was short and in this semi-desert country many of the waterholes failed to fill and rainfall was deficient. Immediately adjacent to the refuge is a Bureau of Land Management crested wheat grass seeding in excess of twenty thousand acres. This, so far as range was concerned, was the one bright spot in the community. Most of it was well watered, but on a considerable area it was necessary to haul water. This patch of grass was a life saver for a number of refuge permittees so far as spring range was concerned. The mid-September rain started the fall feed and many cattle were able to remain out on the range for a longer period.

Early it appeared that refuge pastures generally were going to be real short. Malheur Lake Unit, by reason of the water recession, was well above average in forage production.

An abundant foxtail growth followed the drying of the water and this fresh green feed provided a lot of cattle use, as well as geese grazing where the forage was grazed short along the shore lines.

In the Blitzen Valley and the Double-O units the fall rains materially increased the carrying capacities. Mild weather also made it possible for stock to graze much longer on pasture than normally. Then, too, most operators augmented the pasture with some form of concentrates which would reflect an increase in the carrying capacity of any range. Owing to the timely fall rains, plus the feeding of concentrates in areas of rough feed, the refuge grazing isn't going to reflect the shortage of use that was contemplated earlier in the season. The late winter use perhaps will be short of normal, but the fall and winter carrying capacities were much greater than anticipated.

During the year, 31,142 cattle and horses were grazed for a total of 131,062.3 AUM'S bringing in a cash revenue of $262,124.60.

B. Haying.

No hay permits were issued. Owing to the shortage of irrigation water at critical times during the past two years, the Grain Camp alfalfa seeding hasn't been much of a success. The stand is spotted, but with just one season of timely rains and some light seeding it is hoped that this yet will be a good field. The little hay that was removed from this area this year will be utilized on an AUM basis in the next field.

C. Fur Harvest.

The improvement evidenced in the muskrat population a year ago has largely disappeared because of the recession of the water in Malheur Lake. It appears that seed stock remains, but favorable water conditions will have to prevail for them to reach numbers suitable for harvesting. Other fur bearing animals remain at a low ebb. A number of coyotes, bobcats and raccoon were removed from the refuge.

V. FIELD INVESTIGATION OR APPLIED RESEARCH

A. Progress Report.

1. Aquatic Plant Survey - Malheur Lake.

Introduction: Since 1956, this survey has been based on obtaining samples of submerged aquatic vegetation with a garden rake at selected points along line transects. The transects were plotted between prominent perimeter landmarks visible from the lake, such as buttes, ranch buildings and other objects. This method provided us with data related to this important food resource, but the results were not as precise as desirable. Also, it was difficult to locate sampling points exactly each year for annual comparisons of habitat conditions.

This year we changed the design of the survey to conform to guidelines forwarded to us with Regional Refuge Supervisor Ekedahl's memorandum of April 29, 1965. This technique employs a basket-like sampling tong to sample the vegetation and the volume of the sample is measured by water displacement in containers of known size. Ideally, sampling sites were to be selected by one of three methods: (1) simple random sampling; (2) stratified random sampling; (3) systematic sampling. The ecology of Malheur Lake is such that many sampling sites selected randomly would be inaccessible because of dense hardstem bulrush. Therefore, it was decided to select sampling sites systematically on vertical aerial photographs at locations which would be accessible with the airboat in most years. Fifty sites were selected and marked on aerial photographs (scale 3.168 in. = 1 mile) in the office, based on previous knowledge of ecological patterns in the lake.

We believe this method will provide data of sufficient accuracy to give us the information needed. Figure 1 is a map showing the general location of sampling points. Exact locations are plotted on aerial photographs on file at refuge headquarters for future reference. Literature in the files adequately explains the sampling techniques, so these will not be repeated here. The techniques

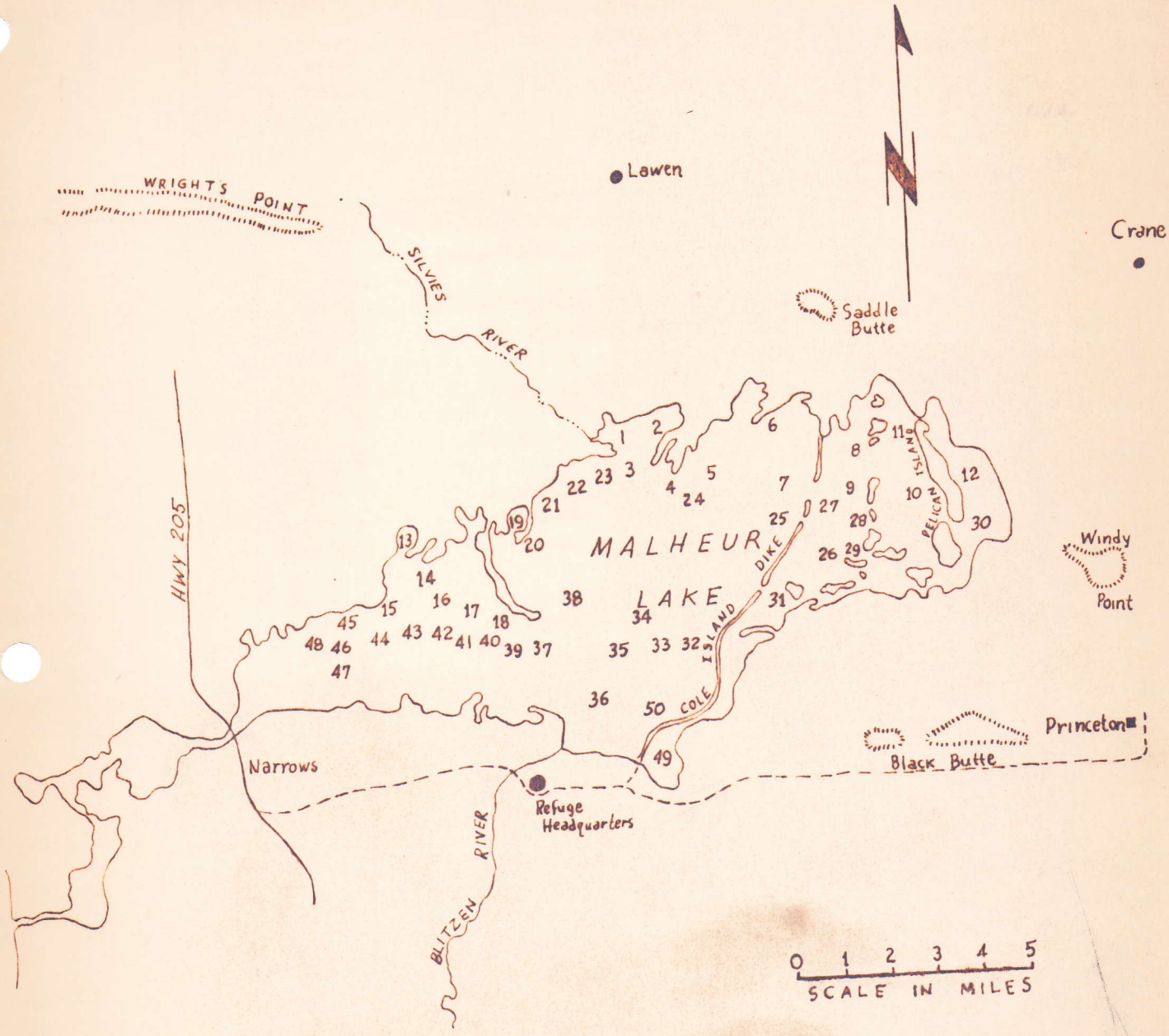


Figure 1. Aquatic plant survey in Malheur Lake, August 1966. (numbers refer to general location of sampling sites)

were perfected by Biologists Sincock and Webster of the Patuxent Wildlife Research Center. Photographs in the picture section will give the reader an idea of how the survey was conducted.

Results: The results of the 1966 aquatic plant survey in Malheur Lake are presented in Table 1. During the time the survey was made this year, the surface elevation was about 4091.6 feet above sea level. Lowest point in the basin is 4089 feet and the highest level attained since coming of the white man is slightly over 4095 feet. Generally, the lake was in the lower range of aquatic plant production this year due to low water levels. Especially noticeable was the reduction in sago pondweed production, both in acreage and seed. On the positive side, however, lower water levels enabled dabbling ducks and geese to utilize sago tubers extensively, in addition to their normal use by canvasbacks and swans.

Water milfoil increased this year in the center section of the lake taking over hundreds of acres which were in sago for the last two years. This was especially noticeable in Saddle Butte Bay and in the open zone along the north shore. Unfortunately, the change in sampling design prevents making any exact quantitative comparisons of vegetation between 1965 and 1966. We had planned to conduct the survey both ways (rake cast vs. tongs) but low water levels and lack of time prevented this. As usual, the best sago pondweed production was in the zone between Cole Island and "Juncus Ridge" in the east section of the lake.

2. Development of Waterfowl Brood-Rearing Ponds.

Shortage of adequate brood-rearing water in proper distribution has long been recognized as a limiting factor to waterfowl production in the Blitzen Valley in some years. The natural topography, wetland ecology and water supply of this area combine to create an ideal environment for attracting high densities of breeding duck pairs. In recent years, these densities have ranged from 50 to 200 pairs per square mile. Often, however, brood-rearing water becomes deficient in quality and quantity before all of the broods reach flight stage. The flightless ducklings either perish or make long journeys overland to find water. Either way, the reproductive potential of the area is lower than would be desirable.

As part of the Master Development Plan for the refuge, small, well-distributed brood-rearing ponds are to be constructed in the Blitzen Valley and Double-O units. A beginning was made on this project in February of 1966, when 50 ponds were dug in ecological units 7 and 8.

Table 1. Results of aquatic plant survey in Malheur Lake, 1966

(For full names of plants, see list following this table)

Sample Site	Date	Water Depth	Species/Abundance	Density of Vegetation
1	8/4	7"	PoPe, 90%; ZaPa, 10%	70 ml.
2	8/4	9"	PoPe, 100%	250 ml.
3	8/4	6"	PoPe, 80%; ZaPa, 20%	110 ml.
4				
5	8/4	29"	PoPe, 15%; ChVu, 5%; MyEx, 80%	390 ml.
6	8/4	17"	PoPe, 50%; ZaPa, 5%; ChVu, 5% MyEx, 40%	360 ml.
7	8/4	26"	PoPe, 25%; ChVu, 5%; PoPu, 25%, MyEx, 45%	320 ml.
8	8/4	7"	PoPe, 100%	440 ml.
9	8/4	9"	PoPe, 100%	120 ml.
10	8/4	dry		
11	8/4	dry		
12	8/4	dry		
13	8/5	16"	PoPe, 30%; ZaPa, 10%; PoPu, 60%	300 ml.
14	8/5	dry		
15	8/5	dry		
16	8/5	6"	PoPe, 30%; ZaPa, 10%; PoPu, 60%	75 ml.
17	8/5	dry		
18	8/5	13"	PoPe, 90%; ZaPa, 3%; PoPu, 7%	300 ml.

Table 1. (Continued)

19	8/4	17"	PoPe, 90%; ZaPa, 10%	340 ml.
20	8/4	10"	PoPe, 30%; ZaPa, 10%; ChVu, 30%; PoPu, 10%; MyEx, 20%	110 ml.
21	8/4	15"	PoPe, 55%; ZaPa, 5%; ChVu, 20%; PoPu, 10%; MyEx, 10%	310 ml.
22	8/4	16"	PoPe, 70%; MyEx, 30%	370 ml.
23	8/4	17"	ZaPa, 50%; MyEx, 50%	140 ml.
24	8/4	18"	PoPe, 10%; ZaPa, 40%; MyEx, 50%	170 ml.
25	8/4	18"	PoPe, 20%; MyEx, 80%	130 ml.
26	8/4	14"	PoPe, 80%; ZaPa, 20%	290 ml.
27	8/4	16"	PoPe, 90%; ChVu, 5%; MyEx, 5%	340 ml.
28	8/4	16"	PoPe, 30%; ChVu, 70%	150 ml.
29	8/5	dry		
30	8/5	dry		
31	8/3	6"	PoPe, 20%; ZaPa, 80%	100 ml.
32	8/4	20"	MyEx, 100%	670 ml.
33	8/4	36"	MyEx, 90%; PoPu, 10%	1,570 ml.
34	8/4	28"	PoPe, 10%; ZaPa, 30%; ChVu, 10%; PoPu, 45%; MyEx, 5%	550 ml.
35	8/4	28"	PoPe, 10%; ChVu, 20%; PoPu, 65%; MyEx, 5%	400 ml.
36	8/4	21"	none	0
37	8/1	12"	PoPe, 5%; MyEx, 95%	100 ml.
38	8/4	20"	MyEx, 100%	740 ml.
39	8/1	14"	PoPe, 85%; ZaPa, 5%; PoPu, 15%	150 ml.
40	8/1	10"	PoPe, 10%; PoPu, 90%	500 ml.

Table 1. (Continued)

41	8/5	18"	PoPe, 50%; ZaPa, 5%; PoPu, 40%; CeDe, 5%	370 ml.
42	8/5	16"	PoPe, 60%; ZaPa, 5%; ChVu, 5%; PoPu, 30%	380 ml.
43	8/5	8"	PoPe, 40%; PoPu, 60%	110 ml.
44	8/5	6"	PoPe, 70%; PoPu, 20%; ZaPa, 10%	90 ml.
45	8/5	6"	PoPe, 40%; ZaPa, 5%; ChVu, 5%; PoPu, 50%	85 ml.
46	8/5	8"	PoPe, 60%; PoPu, 20%; ZaPa, 20%	75 ml.
47	8/5	12"	PoPe, 90%; ZaPa, 10%	120 ml.
48	8/5	10"	PoPe, 30%; PoPu, 70%	70 ml.
49	8/5	dry		
50	8/4	21"	MyEx, 100%	1,100 ml.

Abbreviation	Full Name
PoPe	Potamogeton pectinatus (Sago Pondweed)
ZaPa	Zannichellia palustris (Horned Pondweed)
ChVu	Chara vulgaris (Muskgrass)
MyEx	Myriophyllum exalbescens (Water milfoil)
PoPu	Potamogeton pusillus (Small Pondweed)

Those in Unit 7 were in the Northwest Big Sagebrush Field, Center Sagebrush Field and Rockford Lane Field. Unit 8 ponds were dug in the Little Sagebrush Field, Unit 8 Duck Pond Field, North Center Field, North Meadow Field, South Center Field, House Field and Larson Field. Locations of the ponds are shown on the accompanying maps.

The ponds ranged in size from 20 feet by 90 feet to 170 feet by 170 feet. Most of them were dug to a depth of three to four feet below ground level, with gradually sloping sides. Spoil was leveled and the surface seeded with a crested wheatgrass-sweet clover mixture.

The ponds were placed in lower depressions within wetland areas so they would fill with water during the spring run-off and retain it through early fall. Our intent was to make the ponds shallow enough so they would dry out periodically.

To provide a basis for evaluating the effectiveness of the brood-rearing ponds, two study areas of six square miles each were selected which encompassed the development area. It was planned to obtain an estimate of the breeding pair population in late May and early June, and an estimate of broods produced to provide an estimate of total production in the study areas.

Notes were kept on vegetation in and adjacent to the ponds to provide a record of their first year condition. Later observations should reveal information about vegetative succession and other ecological changes in the new developments.

Each pond was photographed from a reference point during May and June when water levels were at a maximum and vegetation was well advanced. These photos will also provide a basis for comparative photos in future years.

Table 2 shows the breeding population data for six square mile Study Area "A" in Ecological Unit 7. During the time of the census, only about 75 per cent of the potential wetland habitat in this study area was flooded because of deficient run-off this year. Water depths were also lower, making the area less attractive than usual, especially for redheads.

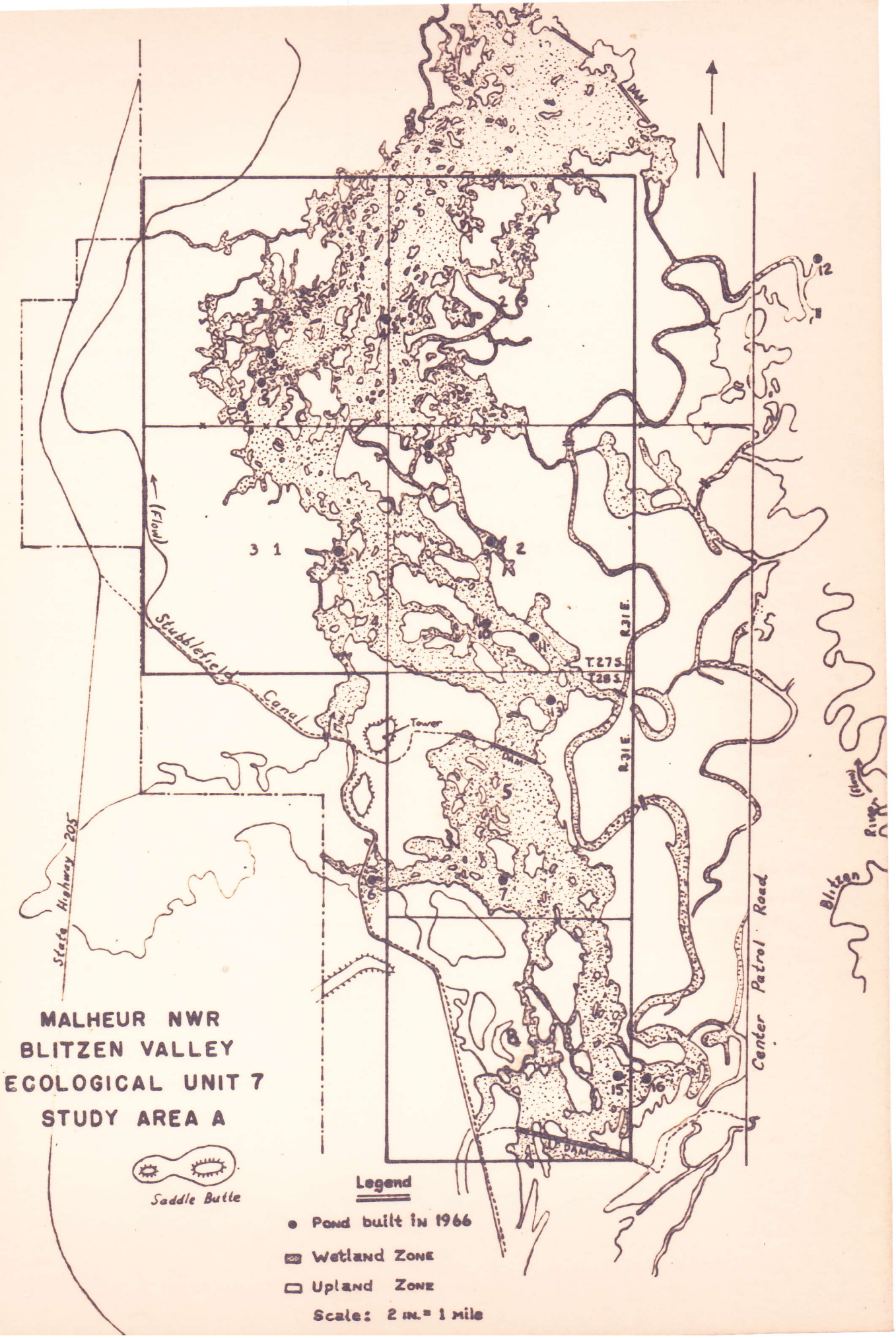
Table 3 shows the breeding population data for six square mile Study Area "B" in Ecological Unit 8.

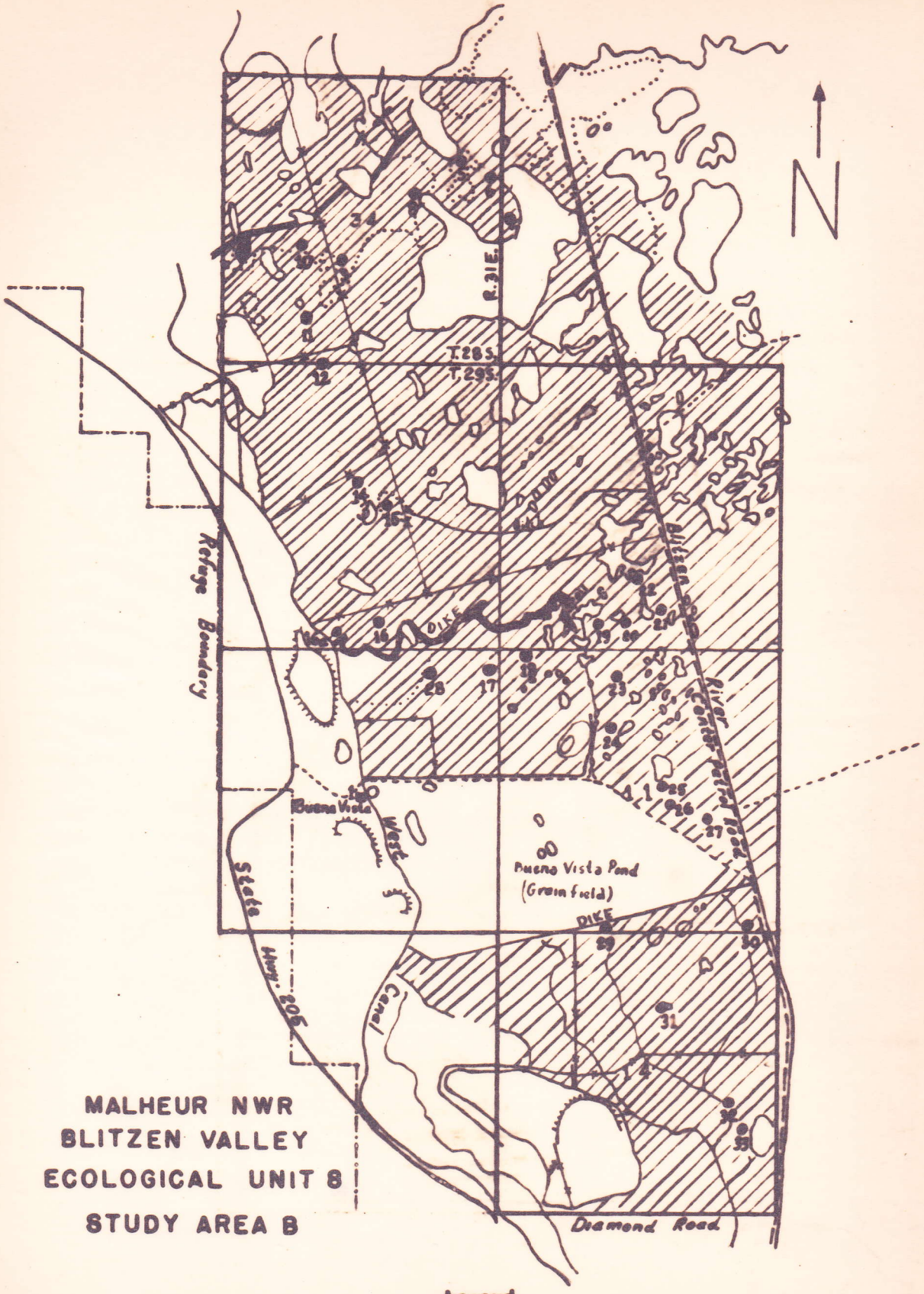
Table 2. Duck breeding pair data for Study Area "A" in Ecological Unit 7. (6-square miles)

Species	No. Pairs Observed				Estimated No. Pairs in Study Area
	NW & Center Sagebrush Fields	Rockford Lane Field	Stubble-field Canal	Total	
Mallard	34	16	6	46	115
Gadwall	35	12	7	54	170
Pintail	13	2	1	16	25
Green-winged Teal	0	0	0	0	5
Blue-winged Teal	3	2	0	5	10
Cinnamon Teal	56	9	20	85	300
Widgeon	12	4	9	25	35
Shoveler	18	3	1	22	50
Redhead	7	9	3	19	35
Canvasback	0	0	0	0	2
Scaup	0	3	0	3	3
Ruddy Duck	0	0	0	0	0
Totals	178	51	47	275	750

Table 3. Duck breeding pair data for Study Area "B" in Ecological Unit 8. (6-square miles)

Species	No. Pairs Observed				Estimated No. Pairs in Study Area
	Unit 8 Duck Pond Area	Larson Field Area	West Canal	Total	
Mallard	13	27	5	45	90
Gadwall	11	32	9	52	95
Pintail	7	3	0	10	18
Green-winged Teal	0	2	0	2	5
Blue-winged Teal	1	3	0	4	10
Cinnamon Teal	13	29	11	53	111
Widgeon	3	2	1	6	10
Shoveler	3	5	1	9	18
Redhead	12	15	2	29	40
Canvasback	0	0	0	0	0
Scaup	0	0	0	0	3
Ruddy Duck	0	0	0	0	0
Totals	64	118	28	210	400


N
DAM
12
(Flow)
3 1
2
Stubblefield Canal
T.27S.
T.28S.
R.31E.
R.31E.
Tower
DAM
5
6
7
State Highway 205
Center Patrol Road
Blitzen River (flow)
15
16
DAM
MALHEUR NWR
BLITZEN VALLEY
ECOLOGICAL UNIT 7
STUDY AREA A
Saddle Butte
Legend
Pond built in 1966
Wetland Zone
Upland Zone
Scale: 2 in. = 1 mile



MALHEUR NWR
BLITZEN VALLEY
ECOLOGICAL UNIT 8
STUDY AREA B

Legend

- Pond built in 1966
- Wetland Zone
- Upland Zone

Scale: 2 IN = 1 mile

3. Canada Thistle (Cirsium arvense) Control Experiment.

In 1964 the following field test was set up to compare the Canada thistle killing abilities of Tordon 10K pellets, Tordon 22K liquid and Amitrol-T.

Four acres densely overgrown with Canada thistle in the northwest portion of the West Grain Camp Field were divided into three plots of one acre apiece and two plots of one-half acre apiece.

Test Plot No. 1, one half acre, was sprayed with 5 gallons of Tordon 22K liquid or two pounds acid equivalent per acre. Time of spraying was September 4, 1964. Test Plot No. 2, one half acre, was sprayed with one gallon of Amitrol-T or four pounds acid equivalent per acre. Time of spraying was September 4, 1964. Test Plot No. 3, one acre, was untreated and left as a control plot. Test Plot No. 4, one acre, was treated with 20 pounds of Tordon 10K pellets, or two lbs. acid equivalent per acre. Time of treatment was November 18, 1964. Test Plot No. 5, one acre, was treated with 22 pounds of Tordon 10K pellets or 2.2 pounds acid equivalent per acre. Time of treatment was November 18, 1964.

In 1965, and again in 1966, each plot was photographed and a general evaluation was made of control accomplished. The 1965 evaluation was recorded in the 1965 NR.

The 1966 evaluation was difficult because the plots were extremely dry and it was impossible to determine visually if dead thistles observed had died from chemicals or from lack of water. Most thistles on the control plot died before they had reached the bloom stage.

On the Tordon 22K and Tordon 10K plots, perennial grasses are more abundant than they were in 1965. Mustard and other annuals have also started to grow. A few thistles are scattered on the 22K plot and approximately 20 per cent of the 10K plots are covered with thistle. About 50 per cent of the surface area on all Tordon plots is either bare soil alone or bare soil covered with dead thistle stalks from the first spraying.

The Amitrol-T plot and the control plot were essentially the same in thistle density; but, on the former, thistle height averaged about an inch lower.

Photo 1A shows a closeup view of a skip on the 22K plot that grew a few thistles. Except for two plants on the right, they had all died by late summer. Whether the plants died from Tordon persisting in the soil or drouth is not known.

Photo No. 3 Untreated Control Plot 66-28-7

Photo No. 4 Tordon 10K Plot 66-28-7

Photo No. 5 Tordon 10K Plot 66-28-4

Photo No. 1 Tordon 22K Plot 66-29-12

Photo No. 1a "Skip" on Tordon 22K Plot 66-28-9

Photo No. 2 Amitrol-T Plot 66-30-17

Table 4. Waterfowl banded at Malheur National Wildlife Refuge, 1966

	Post-Season 1965 (Jan.- Feb.)			Summer 1966 (June - July)					Pre-Season 1966 (Aug.- Sept.- Oct.)					Grand Total
	Male	Female	Total	AM	AF	LM	LF	Total	AM	AF	IM	IF	Total	
Canada Goose	14	19	33	16	16	40	44	116	0	0	0	0	0	149
Mallard	739	464	1203						192	579	100	123	994	2197
Gadwall	1	0	1						2	4	2	1	9	10
Pintail	186	133	319						38	89	59	71	257	576
Green-winged Teal	2	0	2						31	14	5	5	55	57
European Widgeon	1	1	2						0	0	0	0	0	2
American Widgeon	268	146	414						47	60	46	59	212	626
Wood Duck	2	1	3						4	0	1	0	5	8
Total Ducks			1944										1532	3476

4. Waterfowl Banding.

Post-season and pre-season banding of ducks was conducted at Malheur again this year in cooperation with the Continental Banding Program initiated by the Division of Wildlife Research in 1959. Ducks were captured with a cannon net trap at three sites: (1) along the Blitzen River where it enters Malheur Lake (Benson Boat House); (2) Vickers Lake, and (3) Pond 8-32 near Buena Vista. The majority of the ducks were caught at the Boat House site. One shot of the net yielded 422 ducks on September 16, the best catch of the year.

Results of waterfowl banding during 1966 are summarized in Table 4.

During January, a trapping site adjacent to the Blitzen River near refuge headquarters was gravelled. This will provide a permanent banding station in that area which winters several thousand mallards and widgeon and several hundred Canada geese. It is an especially good site for winter banding but not so much so at other seasons. Also, the site at Benson Boat House was fenced to exclude cattle.

Unusual waterfowl captured in 1966 included two European widgeon (a male and a female) at Sod House Pond in January. In March, three "small" Canada geese were captured which were classified as the subspecies (Branta canadensis taverni). Also in March, a mallard x widgeon hybrid was caught and sacrificed for the museum collection.

In addition to new bandings, quite a few previously banded ducks were recaptured. The large number of mallard recaptures emphasizes the fidelity of the mallards to this area over many years. In fact,

	Originally Banded at Malheur Post-season 1965						Banded Elsewhere	Total
	1965	1964	1963	1962	1961	1960		
Mallard	26	62	47	49	8	2	18	212
Pintail	0	0	1	0	0	0	7	8
American Widgeon	0	0	3	3	4	0	1	11
	Pre-season 1966							
Mallard	5	7	3	4	1	0	3	23
Pintail	1	0	0	0	1	0	0	2
American Widgeon	0	0	1	0	0	0	0	1

we have suspected that many of the mallards found here may be essentially non-migratory.

Foreign recaptures (birds banded elsewhere and recaptured here) for which recovery data have been received are summarized below. These only verify known patterns of waterfowl migrations and no unusual records were obtained.

Species	Date Captured	Banded at	Age	Sex	Date Banded
Mallard	Jan. 14	Ninepipe, NWR Montana	A	M	09-13-63
Mallard	Jan. 14	Terreton, Idaho	A	M	09-27-63
American Widgeon	Jan. 14	McNary NWR, Washington	A	M	03-04-65
Mallard	Jan. 17	Tule Lake NWR, Calif.	A	M	08-30-61
Mallard	Jan. 26	Hagerman, Idaho	U	M	11-25-63
Mallard	Feb.	Whitlash, Montana	L	M	07-09-65
Mallard	Feb. 1	Sauvies Id., Oregon	A	M	02-21-64
Mallard	Feb. 22	Gridley, California	A	F	01-16-65
American Widgeon	Feb. 22	Sacramento NWR, Calif.	A	M	01-25-63
Pintail	Feb. 22	Hooper, Utah	I	M	08-21-64
Pintail	Feb. 22	Brooks, Alberta	U	M	08-30-63
Pintail	Mar. 4	Tule Lake NWR, Calif.	I	M	08-04-57
Pintail	Mar. 7	Gridley, California	A	F	02-17-66
Pintail	Mar. 7	Lac Maglaire, Alberta	I	M	08-14-66
Mallard	Mar. 7	Deer Flat NWR, Idaho	A	M	11-03-62
Mallard	Mar. 7	Tule Lake NWR, Calif.	A	M	08-30-61
Pintail	Mar. 16	Tule Lake NWR, Calif.	A	M	08-30-57
Pintail	Mar. 16	Gridley, Calif.	A	M	10-06-60

5. Banding of Other Birds.

a. Water Bird Banding.

Two visits were made to nesting colonies in Malheur Lake for the purpose of banding nesting wading birds.

The first visit on June 10 yielded 28 cormorants and 64 great blue herons and the second visit on June 28 yielded 157 common egrets, 1 snowy egret, 9 black-crowned night herons and 21 great blue herons.

During August and September, 26 sandhill cranes were banded and marked with plastic leg streamers to facilitate individual recognition.

b. Banding of Songbirds.

Mist nets were operated at several locations at refuge headquarters from March through August. This operation provided a total catch of 1,758 birds of 76 species. A rarity for this area was the chestnut-sided warbler captured on June 21.

VI. PUBLIC RELATIONS

A. Recreational Uses.

1. General.

Recreational use of the refuge remains steadily on the increase as is reflected in registrations at the Museum.

In 1965, 3,540 registered and this year a few over 4,000. The visitors were from forty-four states, six foreign countries, four provinces of Canada and Washington, D.C.

Visitations of organized groups of students and churches definitely are increasing. The demand on the time of refuge personnel is likewise increasing.

No new work was accomplished by the State on Highway 205. An exchange of roads between the County and State extended State Highway 205 an additional sixteen miles beyond Frenchglen. It is the consensus of opinion that it is only a matter of a few years and the State will assume the right-of-way to the Nevada State Line at Denio, which will connect with the Winnemucca-to-the-Sea Highway and provide a direct southern route to this part of the State. This improvement will increase refuge visitations considerably.

The construction of the Blitzen River bridge by the Bureau of Land Management, near the P-Ranch, and the improvement of the grade out of the valley provide a much better access to the Steens Mountain Multiple Use area.

The improvement made by Job Corps to the Page Spring camping area makes this site much more attractive to the camping public. A noticeable increase was noted in the fall use of this camping site.

The Bureau of Land Management improvements immediately adjacent to the refuge naturally increase the refuge visitations.

It is estimated that in excess of 20,000 visitors were on the refuge during the year.

B. Refuge Visitors.

Official visitors and those of special note during the year were as follows:

January

6 John McKelvey, Oregon State Police, Burns, Oregon. Routine patrol.
10 Kenneth Meservey, Wildlife Services Trapper, Burns. Predator control on refuge.
14 John McKelvey, Oregon State Police, Burns. Game violation case.
18 Arthur J. Ferguson, Job Corps Coordinator, Washington, D.C. Job Corps Inspection.
Arthur G. Huey, Staff Specialist, Portland, Oregon. Job Corps Inspection.
Henry Baetkey, Assistant Regional Director, Portland, Oregon. Job Corps Inspection.
James Turner, Office of Engineering, Portland, Oregon. Engineering services.
James Stephen, Oregon State Police, Burns. Routine patrol.
27 John McKelvey, Oregon State Police, Burns. Game law violation.
28 John McKelvey, Oregon State Police, Burns. Routine patrol.
Ellis Mason, District Biologist, Oregon State Game Commission, Hines, Oregon. Visit.
James Stephen, Oregon State Police, Burns, Oregon. Routine patrol.

February

1 Harvey O. Edwards, Assistant State Supervisor, Wildlife Services, Portland, Oregon. Predator control plans.
Darrell I. Gretz, District Supervisor, Wildlife Services, Bend, Oregon. Predator control plans.
7 John McKelvey, Oregon State Police, Burns. Routine patrol.
James Stephen, Oregon State Police, Burns. Routine patrol.
14 Don Kistner, Appraiser, Division of Realty, Portland, Oregon. Land acquisition.
Richard D. Mundinger, Appraiser, Division of Realty, Portland.
21 Lynn C. Howard, Refuge Manager, Sacramento Wildlife Refuge, Willows, California.
Norman Warneke, Charles M. Russell Wildlife Refuge, Lewistown, Montana. P-Ranch Station job.
24 Howard Fast, Division of Engineering, Portland, Oregon. Engineering services.
25 John McKelvey, Oregon State Police, Burns. Game law violation.
James Stephen, Oregon State Police, Burns, Oregon. Game law violation.

March

1 William Lindsey, Realty Officer, Portland, Oregon. Land Acquisition.
Walter McAllister, Realty, Washington, D.C. Land Acquisition.

4 V. T. Kirkland, Oregon State Police, Baker, Oregon. Routine visit.
James Stephen, Oregon State Police, Burns. Routine visit.
Marvin Maxwell, Mgr. First National Bank, Burns. Visit.
Robert W. Smith, Allied Land & Livestock Company, Elko, Nevada. Special Use business.
Joseph J. Thackaberry, Allied Land & Livestock Company, San Francisco, California. Special Use business.

8 George H. Berscheid, U.S.D.A. River Basins, Salem, Oregon. General visit.
Darrell Gretz, District Supervisor, Wildlife Services, Bend, Oregon. Raccoon control.
Russell Zink, Wildlife Services Trapper, Crane, Oregon. Raccoon control.

11 Pat O'Keeffe, District Construction & Maintenance Supervisor, BLM, Burns, Oregon. Waterhole development.

16 Tom McAllister, The Oregon Journal, Portland, Oregon. Outdoor story assignment.

21 Richard M. Balsinger, B.I.A., Portland, Oregon. Personnel hearing.
Ralph T. Carpenter, BLM, Portland, Oregon. Personnel hearing.
F. E. Bery, BCF, Portland, Oregon. " "
Arthur G. Huey, Staff Specialist, Portland. " "
Larry Cox, Solicitor, Portland, Oregon. " "
Gibson Bassett, Consolidated Services, Portland." "
Henry Baetkey, Assistant Regional Director, Portland, Oregon. " "

25 Pat O'Keeffe, District Const. & Maint. Supervisor, BLM, Burns. Bridge construction - P-Ranch.

26 Dave Little, Range Conservationist, Burns District, BLM, Burns, Oregon. Water holes.

29 Wm. Striplin, General Engineer, Portland, Oregon. Job Corps.
Ian McGregor, Halibut Commission, Vancouver, B.C. Visit

31 Ray Novotny, Harney County Extension Agent, Burns, Oregon. Lawn examination.

April

6 Dr. Ronald A. Ryder, Colorado State University, Ft. Collins, Colorado. Sandhill Crane study.
Carroll Littlefield, Colorado State University, Ft. Collins, Colorado. Sandhill Crane study.
David B. Marshall, Regional Refuge Biologist, Portland, Oregon.

6-10 Charles Conkling, Photographer, Portland, Oregon. Wildlife pictures.

11 John McKelvey, Oregon State Police, Burns. Routine patrol.
13 Jas. Welton, Dow Chemical Company, Seattle, Washington. Tordon sale.
M. French, Oregon State Highway Department, LaGrande, Oregon. Frenchglen Maintenance Station.
C. D. Cannon, Oregon State Highway Dept., LaGrande, Oregon. Visit and pictures.
A. F. "Doc" Parson, Oregon State Highway Dept., LaGrande, Oregon. Frenchglen Maintenance Station.
Cyrus Cox, Oregon State Highway Dept., Salem, Oregon. Frenchglen, Maintenance Station.
"Mac" McComb, Oregon State Highway Dept., Ontario, Oregon
Newton Hotchkiss, Harney County Judge, Burns, Oregon. Frenchglen Maintenance Station.
Herbert Fawcett, Harney County Road Master, Burns, Oregon. Frenchglen Maintenance Station.
Jas. Tackman, Burns, Oregon. Bridge bid.
John Wooster, Burns, Oregon. Bridge Bid.
Elias Ramirez, Burns, Oregon. " "
14 Ray Novotny, Harney County Extension Agent, Burns, Oregon. Grass tour.
15 Joe Van Wormer, Wildlife Photographer, Bend, Oregon. Pictures.
18 Robert F. Russell, Assistant Regional Refuge Supervisor, Portland, Oregon. Job Corps.
John V. Mack, Construction Management Engineer, Portland. Job Corps.
20 Jas. Stephen, Oregon State Police, Burns, Oregon. Game case.
21 Larry Waddell, U.S. National Bank, Burns, Oregon. Special Use business.
22 Kenneth Knothe, Range Conservationist, BLM, Burns, Oregon. Water holes.
O. C. "Red" Dunning, KOIN-TV, Portland, Oregon. Pictures and program materials.
23 Joe VanWormer, Photographer, Bend, Oregon. Goose pictures on nest.
29-30 Robert Murphy, Free Lance Writer, Westtown, Penn. Data and materials on refuge.
30 Justice Holman, Oregon State Supreme Court, Salem, Oregon. Visit.
Fred A. Anderson, Attorney, Tigard, Oregon. Visit. Fred was first clerk on Malheur 1935.

May

6 Ellis Mason, District Biologist, Oregon State Game Department, Hines, Oregon. Visit.
7 Evelyn Wood, Photographer, Barnaby, B.C. Wildlife pictures.
8 C. D. Cannon, Oregon State Highway Department (Retired), LaGrande, Oregon. Pictures.
D. D. Bradshaw, Oregon State Highway Dept. (Retired), La Grande, Oregon. Pictures.

10 Donn Smithpeter, Office of Engineering, Portland, Oregon. Contract jobs.

13 Phillip Hannifin, OEO District Inspector, Reno, Nevada. Job Corps Center Inspection.

W. Eddleman, OEO, Washington, D.C. Job Corps Center Inspection.

16-19 Eugene Knoder, Biologist, Patuxent Research Station, Laurel, Maryland. Sandhill Crane eggs.

16 Ellis Mason, District Biologist, Oregon State Game Department, Hines, Oregon. Visit.

18 John McKelvey, Oregon State Police, Burns, Oregon. Routine patrol.

Chester Kebbe, Oregon State Game Com., Portland. Visit re/banding.

20 John D. Wendler, M&E, Lakeview, Oregon. Completion of cases pending.

21 Cynthia Lewis, Greensboro, North Carolina. Biology student.

24 Kent Giles, District Manager, BLM, Burns, Oregon. Plans for Steens Mountain Multiple Use trip.

Pat O'Keeffe, Const. & Maint. Supervisor, BLM, Burns.

Charles Conkling, Photographer, Portland, Oregon. Photography.

30 Russell Jackman, Oregon Extension Service (Retired, Corvallis, Oregon. Data for book.

June

1 Paul C. Stewart, Rancher, Caldwell, Idaho. Visit.

4 O. C. "Red" Dunning, KOIN-TV, Portland, Oregon. Pictures and program material.

6. Ray Novotny, Harney County Extension Agent, Burns, Oregon. Grass Tour arrangements.

7 Charles Hansen, Biologist Desert Game Range, Corn Creek, Nevada. Visit with family.

14 Darrell I. Gretz, District Supervisor, Wildlife Services, Bend, Oregon. Predator work.

15 Burton DeGraw, Portland, Oregon. Job Corps employment.

E. R. Jackman, Oregon State Extension Service (Retired), Corvallis, Oregon. Visit.

17 John C. Jones, BSF&W, Washington, D.C. Visit.

Ray Vaughn, Division of Fish Hatcheries, Portland, Oregon. Visit.

Frank B. Jacox, Refuge Management Assistant, Portland, Oregon. Visit.

20 Kenneth A. Elliott, Oregon State Police, Pendleton, Oregon. Visit.

Gary L. Hickman, Wildlife Biologist, Division of Wildlife Services, Boise, Idaho. Eagle study.

Timothy M. Nelson, Boise, Idaho. Ecology of Golden Eagle.

22 Dr. Ronald A. Ryder, Colorado State University, Ft. Collins, Colo. Sandhill crane study.

Carroll D. Littlefield, Colorado State University, Ft. Collins, Colorado. Sandhill crane study.

28 Clifford Smith, County Extension Agent, Benton County, Corvallis, Oregon, Visit.

O.K. Beals, Co. Extension Agent, Marion Co., Salem, Oregon. Visit.

July

5 Darrell Gretz, District Supervisor, Wildlife Services, Bend, Oregon. Predator inquiry.
Ivan Donaldson, Fisheries Biologist, Bonneville Dam, Stevenson, Washington. Visit.

7 Harold R. Fine, General Accounting Office, Portland, Oregon. Plant Inspection.
Riley W. Harvey, Jr., General Accounting Office, Portland. Plant Inspection.

12 Victor Case, Oregon State Game Department, Burns, Oregon. Gravel haul.

15-19 Charles Conkling, Photographer, Portland, Oregon. Photography.

21 O. C. "Red" Dunning, KOIN-TV, Portland, Oregon. Pictures and program material.
Bob Snethen, KOIN-TV, Portland, Oregon. Pictures and program material.
Yasuo Hotta, Biology, UcSD, La Jolla, California. Visit.
A.R.W. Ogasowara, Jiyugaoka, Chikusa-ku, Nagoya, Japan. Visit.

19 Rex Warren, Weed Specialist, Oregon State Extension Service, Corvallis, Oregon, Noxious weeds.

22 Noah Squires, Oregon State Sanitation Board, Bend, Oregon.

August

2 W. E. Green, Biologist, Region 3, Upper Mississippi Refuge, Winona, Minn. Visit.
John V. Mack, Division of Engineering, Portland, Oregon. Job Corps and refuge projects.

3 William J. Law, A&E Regional Office, Portland, Oregon. Engineering services.

17 G. P. McClanahan, Forest Service (Retired), Grants Pass, Oregon. Visit.
John McKelvey, Oregon State Police, Burns, Oregon. Archery Season plans.
Don Johnson, Dept. of Interior, Washington, D.C. Classification.
Ray Michaels, Office of Economic Opportunity, Washington, D.C. Classification.
Mrs. Georgia Sherman, Forest Service, Washington, D.C. Classification.

23 Dale S. Erwin, Pendleton, Oregon. Bureau of Statistics USDA.

24 Marvin C. LeFever, Sheldon Refuge, Cedarville, California. Visit.

30 Harold Corbin, Office of Engineering, Portland, Oregon. Job Corps and Refuge projects.
James Stephen, Oregon State Police, Burns, Oregon. Archery Hunt plans.

September

1 William Farmer, Oregon State Water Resources Board, Salem, Oregon. Basin Water study.
A. V. Meyers, Oregon State Game Department, Portland, Oregon. Harney Basin Water study.
Wm. Pitney, Oregon State Game Department, Portland, Oregon. Harney Basin Water study.

7 Ellis Mason, District Biologist, Oregon State Game Dept., Hines, Oregon. Archery Hunt.
Roy W. Carlson, Lower Souris Refuge, Upham, North Dakota. Visit.

13 Dr. Johnson, Job Corps OEO, Washington, D.C. Job Corps Center.
John Scalease, BIM Job Corps Coordinator, Portland, Oregon. Job Corps Center.
William K. Riesland, State Parks Planning Section, Salem, Oregon. Round Barn, etc.
Elizabeth Walton, Parks Historian, Salem, Oregon. Round Barn, etc.

14 John Mack, Office of Engineering, Portland, Oregon. Refuge and Job Corps projects.
F. V. Olson, Office of Engineering. Albuquerque, New Mexico. Visit with John Mack.

15 Duane Koss, Valentine NWR, Valentine, Nebraska. Visit.
James L. Cation, General Engineering, Portland, Oregon. Project inspection.
Stanley E. Wellman, Construction Inspector, Portland, Oregon. Project inspection.

16 Gaylord Inman, Tule Lake NWR, Tulelake, California. Assistance in Archery Hunt.

19-20 Dr. A. Starker Leopold, Berkeley, California. Refuge evaluation.
Woodrow W. Middlekauff, El Cerito, California. " "
Gordon W. McPeak, Berkeley, California. " "

24-25 Charles Conkling, Portland, Oregon. Photography.

28 Harry Telford, Creswell, Oregon. First Warden on Malheur Refuge in 1910. Visit.
John D. Wendler, Game Management Agent, Lakeview, Oregon. Law enforcement business.
Alva Weinrich, Game Management Agent-Pilot, Sacramento, California. Law enforcement business.

28-29 Frank W. Groves, Supervisor Nevada State Game Department, Reno, Nevada. Visit.

29 Jack F. Welch, BSF&W, Denver, Colorado. Visit.

October

3 J. F. Branson, BSF&W (Retired), Lakeview, Oregon. Visit.

5. Jas. Stephen, Oregon State Police, Burns, Oregon. Routine patrol.
R. Herendeen, Oregon State Police, Baker, Oregon. Routine patrol.

6 John D. Wendler, Game Management Agent, Lakeview, Oregon. Routine patrol.

6 Charles Annis, Engineering Technician (Retired), Portland, Oregon. Visit.

10 George W. Walker, U.S. Geological Survey, Menlo Park, California. Visit.

Don Kistner, Appraiser, Office of Realty, Portland, Oregon. Building appraisals.

Chester E. Kebbe, Oregon State Game Commission, Portland, Oregon. Banding reports.

14 Jas. Stephen, Oregon State Police, Burns, Oregon. Routine patrol..

18 Fred D. Gustafson, State Water Resources Board, Salem, Oregon. Harney Basin Water Study.

W. H. Farmer, State Water Resources Board, Salem, Oregon. Harney Basin Water Study.

Darrell Gretz, District Supervisor, Wildlife Services, Bend, Oregon. Predator Plans.

Willard E. Nelson, Oregon State Supervisor, Division of Wildlife Services, Portland, Oregon. Predator control plans.

31 M. A. Cross, Realty Specialist, Portland, Oregon. Acquisition..
Tom E. Smith, Division of Realty, Portland, Oregon. "

November

1-2 Newell B. Terry, Departmental Personnel Officer, Washington, D.C. Job Corps and Refuge.

John M. Young, Regional Director of Civil Service, Seattle, Wn. Job Corps and Refuge.

Roy F. Renaud, Regional Director of Personnel, Portland, Oregon. Job Corps and Refuge.

3 Donn Smithpeter, General Engineer, Portland, Oregon. Inspection of projects.

Ray Glahn, Pilot-Biologist, Portland, Oregon. Flying census.

8 Pete Carter, Refuge Manager Sheldon Hart Mountain, Lakeview, Oregon. Personnel.

James E. Newman, SCS, Canyon City, Oregon. Snow Survey equipment.

9-10 Charles Conkling, Portland, Oregon. Photography.

E. R. Jackman, Oregon State Extension Service (Retired), Corvallis, Oregon. With Conkling.

11-12 O. C. "Red" Dunning, KOIN-TV, Portland, Oregon. Pictures and program materials.

12 John McKelvey, Oregon State Police, Burns, Oregon. Waterfowl Season.

14 Ronald Culver, Oregon State Sanitation Board, Portland. Frenchglen sanitation.

December

6 Ellis Mason, Dist. Biologist, State Game Dept., Hines. Deer.

14 John McKelvey, OSP, Burns. Waterfowl Hunt.

21 Kenneth Meservey, Wildlife Services Trapper, Burns. Predator control.

29 Lovell M. Groves, Longview, Wn., "Outdoor Pictures" photography.

C. Refuge Participation.

1. Refuge Manager Scharff.

Early in January, in company with Job Corps Center Director E. E. Ludeman, a meeting was attended in Boise, Idaho largely having to do with the employment of minority groups. This meeting was attended by a number of Government employees in the Idaho and Southeastern Oregon area.

During the year the weekly noon meetings of the Harney County Chamber of Commerce were attended eleven times. A number of meetings were attended of both the Wildlife and Highway committees.

During January a report of the Blitzen River Watershed was prepared for the Oregon State Water Resources Board. A detailed study is being made of the waters of Harney Basin in which the refuge is vitally interested.

In January, considerable time was spent in assisting Job Corps personnel in preparing the work program for the Center. Many of the refuge projects are naturals so far as vocational education is concerned.

On January 12, an Extension Service planning program was attended in Burns. This meeting was pointed primarily towards the year's program and budgeting of funds.

Over the year, a number of County-wide Telephone Committee meetings were attended. As a result of the formation of the Rural Telephone Association and the approval of the funds for its construction, Pacific Northwest Bell Telephone Company became interested and eventually took over the project. By the end of the year most of the construction work had been accomplished and all telephones had been installed. The target date set for activation of the entire system is March 18, 1967. Next to electricity, telephone communication will be the greatest boon that has occurred to this part of the state since the invention of the wheel.

On January 17, a County-wide meeting was attended of all committees on the County Water Resources study. The following day, a meeting of the Oregon State Water Resources Board was held in Burns.

On January 24, an article was prepared of the year's activities and accomplishments of the Malheur Refuge for the Burns Times-Herald. This article appeared in an issue of the paper listing the year's

accomplishments of the County. Assistance was rendered Job Corps in preparing a similar article for the Center.

A refuge and Steens Mountain slide program was given at the Burns Rotary Club on January 26. Thirty-four members and guests were present.

A number of the monthly meetings of the local chapter of the Izaak Walton League were attended over the year.

Several meetings of the County-wide Job Corps Advisory Committee were attended during the year.

A Job Corps Planning and Budgeting meeting was attended in Minneapolis, Minnesota on February 15 and 16. Center Director E. E. Ludeman was accompanied on this trip. While in attendance, a thawing spell hit Minneapolis and warmed up fourteen degrees below zero one day.

On February 21 a slide show of the refuge and neighboring Steens Mountain was presented to the Klamath County Dental Association monthly meeting in Klamath Falls, Oregon. Twelve were in attendance.

March 2-3 was spent in the Regional Office with Job Corps Center Director E. E. Ludeman, mostly on Job Corps business.

The semi-annual County Extension Service budget meeting was attended in Burns on March 29. On March 30, the Tri-County (Harney, Grant and Malheur) Livestock Association meeting was attended in Burns.

Late in the fall of 1965, an appointment by the Oregon Historical Society to a State committee for nominating names to the Hall of Fame was received. A meeting of the committee was held in Bend on April 25 at which time several nominations were made for this honor.

On April 26, a meeting of the Harney County Chamber of Commerce Parks Committee was attended. This meeting stressed the need for parks and recreation areas other than on Government-owned lands. A number of small, privately owned tracts of land were being considered for acquisition.

April 29-30 was spent with Robert Murphy, free-lance writer from Pennsylvania, going over the refuge and assembling data for a book on refuges. Subsequently, Mr. Murphy's rough manuscript of the Malheur Refuge was reviewed and suggestions made for changes.

On May 25 a "Show Me" of the refuge headquarters and museum and a tour on Cole Island Dike was given the Diamond school and parents. Thirty-two youngsters and sixteen adults made up the group.

On June 17 the Treasurer's Association of Oregon Counties paid the refuge a visit, taking time out from their annual meeting being held in Burns. There were thirteen in the party. They were shown about the museum and refuge headquarters and treated to coffee and cookies. Refuge and Steens Mountain pictures were shown the group.

Appeared on the program of the Nevada Section of the American Society of Range Management annual summer tour which was held at Cedarville, California on June 21-22. The refuge grazing program was the topic discussed.

Attended the annual meeting of the Harney County Electric Cooperative on May 14. This meeting was held at the Malheur Job Corps Center and was attended by well over two hundred. Saturday, June 25, the annual Harney County Grass Tour was held in the Sod House community. Following lunch and discussions at the Job Corps Center, the tour ended at the Refuge Headquarters where a freeze branding demonstration was held. Leathercraft by 4-H'rs which was on display in the refuge museum building was also viewed.

A group of nine State Extension Service folks were given a tour of the refuge and neighboring grasslands on June 27.

A group of Summer School teachers attending the College of Idaho were given a tour of the Blitzen Valley part of the refuge on July 10.

The evening of July 14, chairmaned the Steens Mountain Multiple Use Committee annual meeting held in Burns. Showed colored slides of the Mountain. The following day was spent attending the Bureau of Land Management sponsored field trip of the Steens Mountain Multiple Use Committee and guests.

A Harney County Water Resources Committee meeting was attended in Burns the evening of July 20.

On July 28, a slide show was given at the Kiwanis noon luncheon. That evening a meeting was attended for the Oregon State Park Commission. The following day, the Blitzen Valley part of the refuge and Steens Mountain were toured with the Park Commission group.

An evening banquet and meeting of the Steens Mountain Multiple Use Committee was attended in Burns on August 11 and the group was accompanied the following day on a tour of the Mountain.

August 7-8 was spent with Congressman Al Ullman along the Blitzen on Big Indian Creek looking over the Multiple Use of Steens Mountain and casting a fly for the wily trout of the Big Indian.

August 1-2 was spent in the Regional Office, mostly on administrative matters having to do with the refuge and Job Corps.

The entire day of September 1 was spent with two members of the Oregon State Water Resources Board and two members of the Oregon State Game Department looking over the refuge and surrounding area and discussing the various wildlife needs for water in Harney County and this section of the State. An evening meeting was attended at the State Game Commission District office in Hines, discussing the more detailed water needs for wildlife.

On September 13, William K. Reisland, State Parks Planning Section, and Elizabeth Walton, Parks Historian, visited the refuge in search of information. During part of the day and evening they were made acquainted with as much of the local history and preservation needs as possible in such a short time.

September 19 and 20 was spent with A. Starker Leopold and Refuge Biologist Harold Duebbert going over the refuge on the ground and finally flying over it. Dr. Leopold is making a study of the refuge system and plans on visiting all of the major refuges in the country.

On September 21, the final soil moisture reading was taken on the Steens Mountain courses. Generally the soil moisture was much improved over a year ago.

On October 18 and 19 considerable time was spent with William Farmer and Fred Gustafson of the Oregon State Water Resources Board going over the refuge water system and needs and flying the area to get a better perspective.

Part of September 18 was spent with Willard Nelson, State Supervisor, Division of Wildlife Services and Darrel Gretz, District Supervisor, discussing fall and winter plans for refuge predator control.

November 11 and 12 were spent with O. C. "Red" Dunning of KOIN-TV taking pictures of deer, raccoon, hawks and eagles for his show. Some excellent pictures were made of duck species at the refuge headquarters in the display pond.

Most of November 14 was spent with Ron Culver of the Oregon State Sanitation Board, viewing and discussing plans for alleviating the sewage situation at Frenchglen.

A meeting of the County Water Resources Committee was attended the evening of November 29 in Burns.

2. Assistant Refuge Manager Pierce.

January - acted as Secretary for the Sodhouse School District Budget Committee.

March 9 - attended weed control meeting sponsored by the County Extension Service in Burns.

March 24-26 - attended conference of the N.W. Section of the Wildlife Society at La Grande, Oregon.

April 16 - presented illustrated talk, "Ecology of Malheur Refuge" and a guided tour of the refuge to ten high school biology students and six adults from Heppner, Oregon.

April 29 - conducted tour of refuge for 27 high school students and three teachers from Dayville, Oregon.

May 6 - with Fred Zeillemaker, presented slide talk, "Ecology of Malheur Refuge," to about 55 members of the Oregon Outdoor Club.

May 9-12 - attended Refuge Managers Workshop at Tule Lake, California.

May 21 - conducted tour for ten biology students from the University of Portland.

June 4 - conducted tour of refuge for Dow Chemical Company public relations man, Ross Wurm.

July 19 - discussed weed control program and visited several areas with Rex Warren, Weed Control Specialist, University of Oregon, and Harry Smith, County Extension Agent.

September 1 - toured refuge and refuge recreational facilities with Toni Rattel, Bureau of Outdoor Recreation representative.

September 13 - went up on the Steens Mountain with Biologist from Oregon State Game Commission to help with the Annual Bighorn Sheep Count. The count had to be cancelled just as we started because a snowstorm caused poor visibility and treacherous footing.

October 26 - presented illustrated talk on waterfowl identification and waterfowl hunting on the Malheur Public Shooting Grounds to ten members of the Harney County Izaak Walton League.

November 15 - presented illustrated talks on waterfowl identification and waterfowl hunting to 120 airmen from the Burns Air Force Base.

December 31 - participated in Annual Christmas Bird Count.

3. Biologist Duebbert.

February 14 through 18 - participated in analysis of waterfowl wings collected in Pacific Flyway during 1965-66 season at Gray Lodge Waterfowl Management Area near Gridley, California.

March 24 through 26 - attended meeting of Oregon Chapter and Northwest Section of The Wildlife Society at Eastern Oregon College, La Grande, Oregon. Presented paper on "Ecology of Malheur Lake, Oregon" on the 25th.

April 3 - presented illustrated lecture on "Ecology and Wildlife of the Malheur NWR" to 25 students in Big Game Management class from Oregon State University, led by Dr. Lee Kuhn.

April 4 - conducted tour of Blitzen Valley for above group.

April 15 - showed movie "Wings over Blitzen Valley" to 25 students from College of Idaho, led by Miss Patricia Packard.

April 23 - conducted tour of Cole Island Dike for 11 Cub Scouts from Den 8, Troop 440, Burns, led by Mrs. Ronald Clark, Den Mother.

April 25 - conducted tour of Blitzen Valley for 12 Biology students from Stayton (Oregon) Union High School, led by Mr. Don McKenzie. Showed movie: "Wings over Blitzen Valley" to this group in evening.

April 29 - showed movie, "Wings over Blitzen Valley," to 20 ornithology students from Eastern Oregon College, La Grande, led by Dr. Charles Quaintance.

April 30 - conducted tour of Blitzen Valley for above group.

May 3 - conducted tour of refuge museum and waterfowl display pond for 25 students from Sod House School, led by Mrs. Jack Campbell, teacher. Also showed movie, "Wings over Blitzen Valley."

May 6 and 7 - attended 27th Annual Biology Colloquium at Oregon State University, Corvallis. Subject was "Animal orientation and navigation."

May 10 through 12 - attended workshop meeting for refuge personnel held at Tule Lake NWR, Tulelake, California.

May 13 - showed slide series on "Ecology and Wildlife of Malheur NWR" to ten students in a Natural History of Vertebrates class from Whitman College, Walla Walla, Washington, led by Dr. Remple.

May 14 - conducted tour of Blitzen Valley for above group.

May 20 - conducted tour of Blitzen Valley for 40 students from the 7th and 8th grades of Mt. Vernon (Oregon) Grade School, led by Mr. Manuel Borge.

September 5 through 9 - attended 84th Annual Meeting of The American Ornithologists Union at the University of Minnesota, Duluth, Minn.

4. Biologist Zeillemaker.

April 5 - conducted a three-hour tour on Cole Island Dike and presented an illustrated lecture on refuge ecology to Mr. Eugene Ellis and his group of 21 students from the Monticello Junior High School, Longview, Washington.

April 9 - conducted an all-day tour of Cole Island Dike, Harney Lake and Double-O and gave an illustrated lecture on refuge ecology to 20 ornithology students from Boise College, Boise, Idaho, led by Mr. Bill Belknap.

April 22 - acted as MC for "Red" Dunning who showed film to Livingston Jr. Academy group from Salem, Oregon, and refuge personnel.

April 23 - conducted tour on Cole Island Dike and refuge display pond for 45 biology students from the Livingston Junior Academy led by Mr. Vernon Sample.

April 24 - presented an illustrated lecture on refuge ecology to above group.

April 26 - accompanied Harold Duebbert and noted wildlife photographer Joe Van Wormer on Canada goose nest photography expedition.

April 30 - conducted a tour of the refuge headquarters area for 25 members and leaders of the Pueblo Valley 4-H Club from Denio, Nevada.

May 3 - conducted tour of Cole Island Dike and the south end of the Blitzen Valley for Miss Carol Shultz and ten biology students from Wilder High School, Wilder, Idaho.

May 6 - presented illustrated lecture on refuge ecology and showed the movie "Wings over Blitzen Valley" to 150 members of the Oregon Outdoor Club, Creswell, Oregon (Mr. Albert Maas, President).

May 7 - conducted all-day tour to Cole Island Dike for Oregon Outdoor Club (with 20 automobiles!).

May 20 - conducted all-day tour to Cole Island Dike and Blitzen Valley for 25 biology, ornithology and ecology students from Walla Walla

College, College Place, Washington, led by Messrs. Kenneth Growes and Don Blake. Showed movie "Wings over Blitzen Valley" to the group in the evening.

May 21 - with Del Pierce, presented a two-hour slide show program to groups from Walla Walla College and Portland University zoology class of 20 led by Mr. Collins.

May 26 - conducted "show-me" headquarters tour for 20 students and teachers of the 5th grade, Hines Grade School, Hines, Oregon.

May 30 - conducted a tour to Cole Island Dike with Mr. Gordon Murphy and 30 biology students from the University of Oregon, Eugene.

June 4 - thirty members of the Chehalis Outdoor Club, Chehalis, Washington led by Mr. Cliff Dunn were given a tour of Cole Island Dike and an illustrated talk on refuge ecology.

5. Student Trainee Anderson.

July 8 - assisted Biologist Duebbert with a showing of the movie "Wings over the Blitzen Valley" to a teachers' group from the College of Idaho, led by Miss Patricia Packard.

July 9 - conducted a tour for the above group to Cole Island Dike and along the full length of the Blitzen Valley.

July 15 - presented a slide show and lecture on the ecology of the area to the laboratory and field methods class from the University of Oregon, led by Mr. John G. Lepley.

July 17 - conducted a tour of Cole Island Dike during the morning for the above group.

D. Hunting.

1. Waterfowl.

An estimated 1486 hunters bagged approximately 3106 ducks and 758 geese for an average of 2.09 ducks and .51 geese per hunter day. Crippling loss was about .57 birds per hunter.

Duck species predominant in this year's hunter bags differed considerably from last year's bags, particularly in percentage of widgeon which accounted for 40 per cent of the duck bag this year compared to 17 per cent last year. Percentages for other species

with last year's percentage in parentheses are as follows: gadwall, 14% (9%); pintail, 12% (24%); mallard, 11% (16%); canvasback, 9% (5%); green-winged teal, 9% (10%); shoveler, 3% (9%); redhead, less than 1% (7%).

Goose kill on the public hunting area was the best ever recorded for the refuge. Of the more than 750 geese taken almost 90 per cent were Great Basin Canadas. Other species and subspecies taken were snow geese and white-fronted geese, each comprising approximately 5 per cent of the total goose bag, and a few cacklers and lesser Canadas. One party of eight hunters checked on opening day had 24 large honkers.

Table 1 is a summary of waterfowl bag data on the Malheur shooting area for the last ten hunting seasons the area was open.

Waterfowl hunting was good on areas surrounding the refuge. Buchanan, Princeton, Island Ranch, Sodhouse, Double-O and other areas reportedly produced good bags of waterfow, especially Canada geese.

Since most of last year's public hunting area was dry this year, 8,000 acres were added to the east side to include more marsh and water for the 1966 season. The 1966 public hunting area took in 18,000 acres along the north part of Malheur Lake, including about 5,000 acres of marsh. Roughly 60 per cent of the less than 1500 hunter use days were on the 600-800 acre marsh area near the east campground. Another 10 per cent of total hunter use was goose hunting on upland areas. This means over 4,000 acres of prime marsh received only about 300 hunter use days of use this year.

Waterfowl hunting use in 1966 was about 15 per cent less than in 1965. This decrease is partially due to the drying up of last year's area and partially due to difficult access to the better hunting areas on the east side. Many hunters finding the areas they hunted in 1965 dry this year chose not to hunt the Malheur area at all. The access road to the east side, where the best marsh hunting was located, became so muddy after the first week in November only 4-wheel drive vehicles could negotiate it.

In general, hunters were well behaved. Vandalism was negligible, littering was minor and there was very little problem with gates being left open. The latter is remarkable considering almost every vehicle entering the hunting area had to go through at least three wire gates.

A summary of the archery seasons on the Malheur National Wildlife Refuge since the hunt's inception in 1956.

Year	Hunters	Deer				% of Hunters Successful	Length of Hunt
		Bucks	Does	Fawn	Total		
1956	135	17	14	2	33	24.4	5 days
1957	265	15	20	21	56	21.1	3 "
1958	275	14	29	18	61	22.1	3 "
1959	346	11	20	22	53	15.3	2 "
1960	295	3	8	9	20	6.7	3 "
1961	133	6	6	17	29	21.8	3 "
1962	184	6	8	7	21	11.4	3 "
1963	209	11	18	9	38	18.1	3 "
1964	200	5	5	1	11	5.5	2 "
1965	149	3	3	5	11	7.4	3 "
1966	189	4	7	12	23	12.2	3 "
Averages	216	8.6	12.5	11.2	32.4	15.1	

Table 1.

TEN-YEAR HUNTER SUCCESS STATISTICS, PUBLIC SHOOTING AREA,

Malheur National Wildlife Refuge, Oregon

		TOTAL KILL		SUCCESS RATIO (Birds per Hunter)		
Year	Hunter Days	Ducks	Geese	Ducks	Geese	Total
1949	1,401	1,676	360	1.20	.26	1.46
1950	No hunting on refuge due to low water					
1951	1,096	1,528	129	1.40	.12	1.52
1952	625	1,682	73	2.70	.12	2.82
1953	1,942	2,935	408	1.51	.21	1.72
1954	988	1,114	273	1.13	.28	1.41
1955	No hunting on refuge due to low water					
1956	1,161	2,287	280	1.97	.24	2.21
1957	1,423	3,464	165	2.54	.12	2.66
1958	1,143	2,537	217	2.22	.19	2.41
1959-64	No hunting on refuge due to low water					
1965	1,725*	3,000**	150**	1.76	.09	1.85
1966	1,486*	3,106**	758**	2.09	.51	2.60
10-Year Average	1,299	2,332	281	1.85	.22	2.07

* Estimated from spot checks and car counts. Prior to 1965, hunters were required to register at a checking station.

** Estimated from bag check samples. Prior to 1965, all bags were recorded at a checking station.

2. Deer.

During the special bow and arrow hunt for deer in the P-Ranch area September 17, 18 and 19, archers took 23 deer including three forked horns, one spike, seven does and 12 fawns. Four, possibly five, deer were found that had been killed with arrows and either abandoned or lost.

Most of the 189 archers registered for the hunt had at least one shot at deer. Several claimed they had passed up easy chances at fawns in hopes of bagging a larger deer. Two parties reported wounding deer, then losing them.

As usual with the Malheur Hunt, about 80 per cent of the participants were from western Oregon.

E. Violations.

Only two apprehensions, each involving the taking of a swan, were made on the public hunting ground this year. One involved a juvenile and was not processed; the other, involving an officer from the Burns Air Force Base, resulted in a $25.00 fine, plus $5.00 cost, in the Burns Justice Court.

Violations and rumors of violations seemed to be much less this year. State Police Officers working the public hunting area did not observe any violations other than a few minutes late shooting for which no citations were issued. Occasional reports from hunters were received who observed other hunters shooting at swans and similar observations were made by refuge personnel; but, owing to the uncertainty of who was doing the shooting, no citations were made. No swans were observed actually being killed.

As is always the case, some illegal waterfowl hunting took place near the refuge boundaries and especially about the P-Ranch and Double-O areas, but no apprehensions were made.

Four known deer were killed illegally on the refuge. One arrest was made by State Police Officer McKelvey when he apprehended a hunter in the process of butchering a little buck near the P-Ranch Station. This violator was fined $25.00 and $5.00 costs in Justice Court.

Officer McKelvey made fifteen illegal angling cases on the refuge and Officer Stephen made one. Most of the cases were made about the Page Diversion Dam for fishing too close to the fish ladder. Even though

this dam is posted, many anglers are tempted by the big hole near the outlet of the ladder. As an old Chinese cook from Burns put it, when he was paying his fine, "Lotsa money but still good place to fish."

At the end of the period, three cases were pending. One for an over limit of pintails and two for hunting without a Duck Stamp.

F. SAFETY.

The Station SAFETY committees for this year were as follows:

January 1 to April 30 - Delano A. Pierce (Chairman), Elmer Reynolds and William Ankney (Members)

May 1 to August 31 - Noel L. Cagle (Chairman), Quentin L. Currey and Alfred S. Ludi (Members)

September 1 to December 31 - Harold F. Duebbert (Chairman), Marvin Jess and Marselle Leake (Members); the chairman was replaced by Delano Pierce when Mr. Duebbert transferred Nov. 6.

The committees conducted four committee meetings and six Station SAFETY Meetings.

One vehicle accident was investigated by Station SAFETY Committee and two personal accidents were investigated and reported on.

Various SAFETY literature was received and reviewed and selections made for routing to all refuge personnel and families.

The film "The Inner Mind of Milton Whitty" was shown at the August 8 Station SAFETY Meeting.

Three Station Fire Drills were held during the year.

VII. OTHER ITEMS

A. Items of Interest.

A number of personnel changes took place during the year. On March 13 William G. Ankney, Maintenanceman at the P-Ranch Station, transferred to the Malheur Job Corps Center. Mr. Ankney had assumed this position

on November 7, 1965 and was just becoming acquainted with the area and neighbors. On August 28 Jack D. Coulter transferred to the P-Ranch Station from the Charles Sheldon Refuge. Harold F. Duebbert, Refuge Biologist, transferred to the Northern Prairie Wildlife Research Center, Jamestown, North Dakota on November 6. The position had not been filled at the close of the period. Alfred S. Ludi retired December 30 after serving as Building Repairman since September 16, 1946. Al will be living in Burns where he owns his home. Uncle Sam tapped C. Fred Zeillemaker for military service and Fred was furloughed July 10 for a two-year period. The last heard from Fred he had received his Commission in the Navy and was preparing to ship out to Japan. Walter L. Anderson, Student Trainee (Biology) served June 6 through September 10 when he was furloughed to return to school. The ranks keep thinning and replacements are difficult to come by. Maybe we will resort to trading some of the rolling stock for a span of mules and a rubber-tired wagon, which was excellent equipment in 1935-36. It appears that the staffing may revert to about the same period.

On March 25, Wildlife Biologist Harold F. Duebbert, presented a paper on the ecology of Malheur Lake at the annual meeting of the Oregon Chapter and Northwest Section of the Wildlife Society, LaGrande, Oregon. This paper has attracted much attention throughout the Service and Mr. Duebbert is to be commended for an excellent job.

On April 13 representatives of the Oregon State Highway Commission, personnel of the Harney County Road Department and Refuge Manager Scharff selected a site suitable for a Highway Maintenance Station at the edge of Frenchglen on refuge-owned land. A Special Use permit was issued for the use of this site and by the end of the period a new State Highway Maintenance Station was in place. The entire lot had been black-topped and cindered. An equipment and shop building was constructed and pads poured for six trailer houses. Five new trailer houses were in place and the station fully manned. A complete sewage system and disposal field had been provided. This station will maintain State Highway 205 from the south end near Roaring Springs Ranch to Wright's Point, twelve miles south of Burns. This is a valuable addition to the Frenchglen Community.

The evening of April 22, O. C. "Red" Dunning of KOIN-TV station in Portland showed movie pictures taken on and about Malheur Refuge to refuge and Job Corps personnel and neighbors.

The Fred A. Anderson family of Tigard, Oregon flew in to visit the refuge and personnel on April 30 and May 1. Fred, now a successful attorney, was the first Clerk on Malheur in 1935 and usually he and his family pay the refuge a visit a couple of times each year.

Eugene Knoder of the Patuxent Research Station spent May 17-19 on the refuge collecting sandhill crane eggs to continue the sandhill crane study. He was assisted by refuge personnel and on May 20 Refuge Manager Scharff drove him to Boise, Idaho to take the plane back to his station. Fifteen eggs were collected for the portable incubator.

Ross Wurm of the Dow Chemical Company spent several days with a photographer on the refuge early in June securing pictures and data for an article on the refuge that appeared in their Company magazine "Diamond," Number Three 1966. This article has resulted in inquiry about the refuge as far east as Illinois.

On June 7 to 9 Biologist Charles Hansen of the Desert Game Range with his family were visiting Malheur. Chuck previously worked here and Pat is responsible for most of the taxidermy work in the refuge museum.

On Saturday, June 25, the annual County Wide Grass Tour was held in the Sod House area. Lunch was served at the Job Corps Center and much of the discussion took place there. The Tour ended with a freeze-branding demonstration at the refuge headquarters. A County-wide 4-H leathercraft display was held in the refuge museum. Two hundred thirty were in attendance.

On July 7 and 8, Harold Fine and William Harvey of the General Accounting Office reviewed on the ground the refuge land pattern.

On July 9, in cooperation with State Police Officer John McKelvey, a man was cited for "litter bugging." He was moving an old trailer house across the refuge in the vicinity of the P-Ranch Station and enroute scattered pieces of the trailer and contents along the road with no intention of cleaning up the mess. At the time of apprehension, the culprit had recently consumed most of a pint of Old Taylor and was just in the right mood to defy the law and do as he pleased. After a short discussion of the matter he agreed to clean up the litter and upon his appearance in court he received instructions, along with the fine, to again go over the refuge road and further police up.

On August 18, a rash of lightning occurred in the Blitzen Valley, starting three fires and shattering a number of telephone poles. At that time, no one was stationed at the P-Ranch, but permittee Fred Witzel was on the alert with his Bean Sprayer filled and ready to go. When the first strike occurred, Fred reported it to the office and immediately left for the fire. This strike was in the middle of a large field of bunched hay. The second strike was at the base of a telephone pole in a dry marsh. By the time refuge personnel and equipment arrived on the scene, both fires were well under control. Later, two other fires were

started in the Buena Vista area, but by the time personnel had reached the area they could not be located. The next morning, a plane was chartered and one of these fires was located smoldering in a patch of dense bulrush. The other one could not be located but was later found. It had burned a windrow of raked hay and had gone out at the end of the row.

On August 29 a hail storm hit the refuge headquarters, doing a lot of damage to the flower beds and gardens. Hailstones over an inch in diameter fell. During the height of the storm two raccoon came racing across the lawn headed for a spruce tree where more protection was afforded.

Frank W. Groves and Mrs. Groves visited the refuge on August 28 and 29. Frank is State Game Supervisor of Nevada. His career in game management started a number of years ago on this refuge. Later he served as Refuge Manager of the Desert Game Range.

Harvey C. Telford paid the refuge a visit on August 29 of this year. Mr. Telford was the first Game Warden assigned to the Malheur Refuge 'way back in about 1910. He is now a retired commercial fisherman from Alaska. On September 27 Refuge Manager Scharff and Refuge Biologist Duebbert met Messrs. Ekedahl, Marshall, Jacoby and Dougall in Bend and discussed with them the plans for the future of Malheur Lake. This was in conjunction with the Water Resources study now being made of the Harney Basin.

Jean F. and Mrs. Branson visited the refuge on October 3. Jean is now retired. He was for a time Manager of the Hart Mountain Refuge and later was assigned to the Tule Lake Refuge from where he retired.

Charley and Mrs. Annis visited the refuge on October 6. Charley was Engineering Technician and in charge of the Office of Drafting for many years in the Regional Office.

George W. Walker and Alex Swanson of the Geological Survey visited the refuge on October 6 in connection with the mineral examination of refuge lands being considered for Wilderness.

On October 20 the Directorship of the Malheur Job Corps Center was transferred from E. E. Ludeman to Ernest Magill. Shortly after that, Mr. Magill transferred to a Forest Service Center in California and Mr. James MacFarlane has been Acting Center Director since, pending the time a new Director is selected. Mr. Ludeman transferred to Washington, D.C. to head up the Vocational Training Department of the Job Corps Program.

As a Job Corps project, the headstones of two pioneer graves were restored and the graves fenced on the refuge near the Narrows. Similar graves will be restored elsewhere on the refuge.

On December 6 Ellis Mason, State Game District Biologist of Hines, Oregon and "Bud" Mitchell, Game Biologist for the Bureau of Land Management, Burns, Oregon visited the refuge in connection with a planned browse planting and study in the vicinity of the P-Ranch.

Gaylord Inman, Refuge Manager from Tule Lake Refuge, assisted in conducting the Archery Hunt in the upper Blitzen Valley.

A total of one hundred seventy-five "Bills for Collection" were issued for the period January 1 through December 31, 1966. These billings totaled $257,682.11

A group of four Airmen from the Burns Radar Base, two of them with their sons, showed Assistant Refuge Manager Pierce two swan they had shot and asked him if they were snow geese or Ross' geese. They said this type of geese had been flying over them all morning and, although they had exhausted several boxes of shells, they had only managed to bring down the two. Pierce gave them a quick course on goose and swan identification, cited one of the men for taking a swan and warned one of the juveniles who had shot the second swan.

A few days later, Major Thoren, the Commanding Officer of the Base, was called and a slide talk on waterfowl identification was suggested, Major Thoren, an enthusiastic waterfowl hunter himself, called a special meeting for the talk and made it mandatory for all personnel to attend. Mr. Pierce, who gave the talk, was given a steak dinner, a tour of the Station, and an invitation to join the Base Sportsmen Club.

Several persons were interested in the management of the refuge and asked a number of questions. At one time it was mentioned that photos were used for habitat evaluation, census, etc. Major Thoren asked if the Air Force could be of any help in the photography work of the refuge. He said photo reconnaissance planes operating out of Mountain Home, Idaho could give us photos from 1,000 feet from which, "You could census your field mice."

Needless to say, there is considerable interest in this proposal. The Idaho Base has said they would be glad to cooperate and all they required was to advise them what was needed. It is felt that this is an opportunity which should be thoroughly explored.

B. Composition Credits.

John C. Scharff: Sections I A; I B-1; II D, E, F, H, I; III A, III B-1, B-2, B-3, B-4; III C, E, F; IV A, B, C; VI A, B, C-1, E, F; VII.

Harold F. Duebbert: Sections I B-2; II A, B, C; V A-1, 2, 4, 5; VI C-3.

Delano A. Pierce: Sections II G; III D; V A-3; VI C-2, D.

Noel L. Cagle: Basic information for III A-1.

Marselle Leake: Basic information for III A-2.

Alfred S. Ludi: Basic information for III A-3.

C. Fred Zeillemaker: VI C-4.

Walter L. Anderson: VI C-5.

Irma G. Gail: All typing and proofreading.

SIGNATURE PAGE

Submitted by:

(Signature)
John C. Scharff

Refuge Manager
(Title)

Date: February 10, 1967

Approved, Regional Office:

Date: _____

_____
(Signature)

_____
(Title)

A tranquil view of geese on Sod House Pond at sunset.
- Scharff

Hail fell at headquarters on August 29 at 6:00 p.m.
- Scharff

Large numbers of pelicans used the Sod House Pond at refuge HQ during July. As many as 500 were on this small pond (about 200 yards in diameter) at one time.
- Scharff

Hunting dog and a full bag of canvasback drakes on the Malheur public hunting area. - Duebbert

Two successful hunters of the Malheur public hunting area. - Pierce

A quality bag of five "bull" canvasbacks taken on the public hunting area by a selective hunter. - Duebbert

66-7-19. Hybrid mallard x widgeon captured at mouth of Blitzen River, March 16. Made into museum specimen for refuge collection. - Duebbert

Closeup of young golden eagle head during banding.
- Anderson

66-21-19. Student Trainee Walter Anderson with two fledgling great blue herons during banding operation at the Malheur Lake nesting colony. - Duebbert

Riprap being placed at the headquarters display pool.
- Pierce

66-13-20. One of 16 wire baskets erected as goose nesting sites in dead willows at East Knox Pond. Fifteen of the baskets were used by geese.
- Duebbert

66-30-9. One of the 189 archers participating in the P-Ranch archery hunt. - Pierce

Doe and two fawns with trumpeter swan in background. - Anderson

Refuge Manager Scharff sets dynamite charge in concrete spring box on the bed of drained Krumbo Reservoir.
- Pierce

Harold Duebbert inspects results of dynamite blast. The concrete was destroyed but some fish lived. Notice the dead roach in the pool. - Pierce

Truck from Hagerman National Fish Hatchery planting 11" rainbows above Page Dam. - Pierce

Oregon State Fisheries Biologist Larry Bisbee holds up two rainbow trout caught in gill net in Krumbo Reservoir. Krumbo was in process of being drained when Mr. Bisbee sampled the population on June 17. - Pierce

Maintenanceman Jack Coulter inspects rotenoned spring-hole in Krumbo Reservoir. All fish shown are roach.
- Pierce

Mature sandhill crane just banded and tagged on both legs by Refuge Manager Scharff and Student Trainee Anderson is ready to do battle.
- Pierce

Sandhill cranes under cannon net in Larson Field. Twenty-six cranes were captured, banded and color-marked individually as part of a study of crane ecology.
Sept. 6, 1966 - Scharff

Sandhill crane with plastic streamers attached to legs.
Sept. 6, 1966 - Scharff

66-15-4. Much of the wetland habitat in the Blitzen Valley is attractive to breeding ducks, but loses water rapidly before broods can fly. This view in the Center Sagebrush Field is typical.
May 25, 1966 - Duebbert

66-15-15. To correct this situation, small ponds are being constructed to provide adequate brood rearing water. Fifty were built this year in units 7 and 8.
Pond 7-5, May 25, 1966 - Duebbert

Islands constructed in Benson Pond during 1966.
- Pierce

A late June frost resulted in some wheat kill in West Knox Pond. Damage shows as yellow. In spite of the frost damage a good yield was obtained.
- Pierce

66-26-11. Boca Lake's bottom produced about 150 acres of very vigorous nodding smartweed (Polygonum lapathifolium) when water levels receded.

- Duebbert

Wintering cattle near P-Ranch headquarters.

- Pierce

66-4-18. Old Wright Field Bridge.

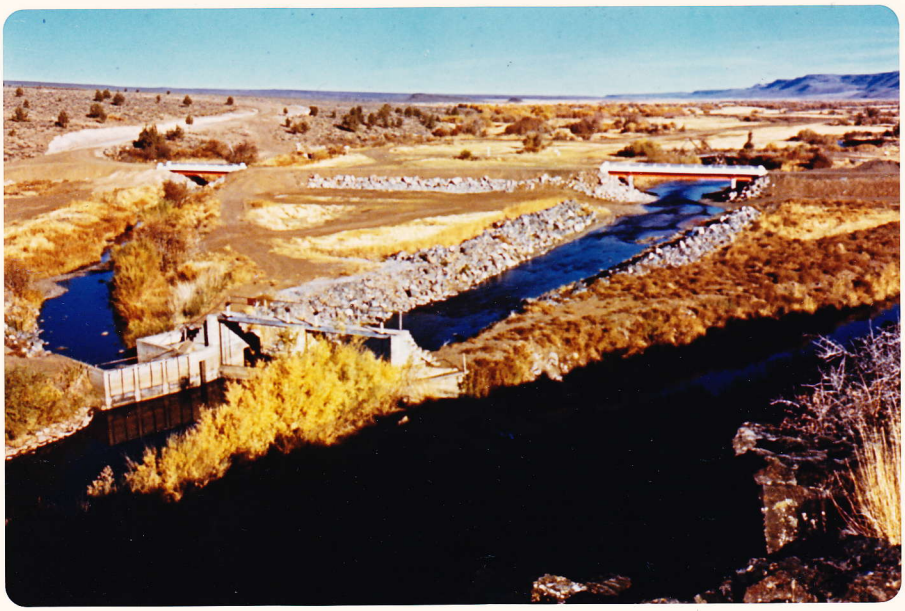
- Pierce

New Wright Field Bridge.

- Pierce

New fence construction on northeast part of Malheur Lake.
- Scharff

New bridge constructed across the Blitzen River at Five-Mile Road during the summer. - Scharff



Two new bridges provided across the Blitzen River and East Canal by BLM on Fish Lake Road.

- Scharff

66-5-8. One of the Job Corps projects in 1966 was to clear willows from along the Blitzen River in the P-Ranch area.

- Pierce

Loading cinders for the Center Patrol Road which was widened, built to grade and surfaced during the summer by contract. - Scharff

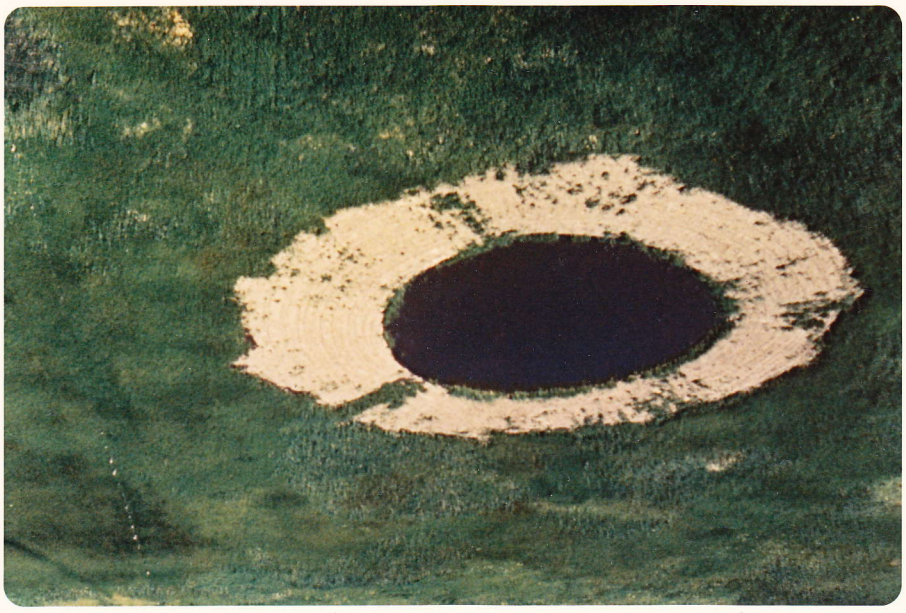
66-16-11. Road sprinkler converted from Air Force fuel truck being used on Center Patrol Road improvement. - Pierce

66-10-15. BLM (left) and Refuge (right) combine to lift and set preformed concrete abutments for East Canal Bridge.
- Pierce

Construction of the East Side Canal lateral by force account.
- Scharff

Pothole construction in Big Sagebrush Field had to be postponed because wet weather made the ground soft and the Job Corps tractor kept getting bogged down.

- Pierce



66-22-11. Aerial view of new pond in Unit 8 showing shape and method of spreading spoil.
July 22, 1966

- Duebbert

upside down

Headquarters for the huge Malheur Refuge is the "Sod House Ranch," center of activity for the 180,000-acre "outdoor hotel" in southeastern Oregon.

A REAL REFUGE

In a Remote Corner of southeastern Oregon, John Scharff manages the largest "outdoor hotel" in the United States. It covers 181,000 acres and is called the Malheur Wildlife Refuge.

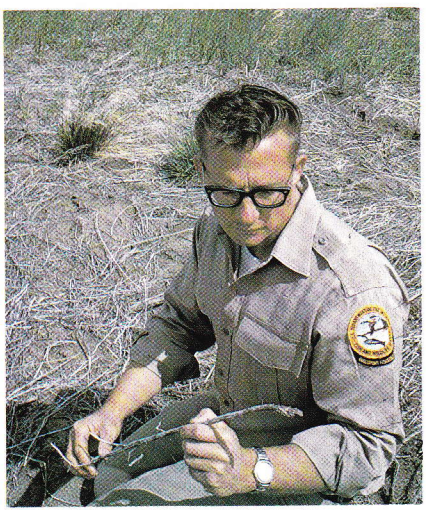
Scharff and his staff provide their clientele with free meals, a rest stop, a registration service (through banding), and hovering nursery care to hundreds of thousands of migrant wildfowl each year.

While these are the primary responsibilities of Scharff, he has extended his services considerably. On these same acres, he has developed a complete river system and meadow and range lands for livestock grazing to serve about 70 permit holders each year.

Malheur Refuge is in the shadow of the 9,500-foot-high Steens mountain range in Harney County. The Blitzen River forms from the snow drifts on the Steens and provides irrigation water for 40 square miles of land.

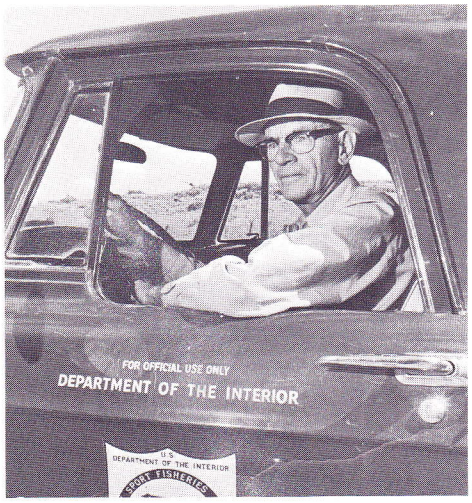
Although the area was first ranched and farmed in the 1870's, its system of dams, ditches and flooded meadowlands has come into being since Scharff, a quiet-spoken ex-cowhand and former forester, came on the job in 1935. The refuge can now support up to 20,000 head of livestock during years of good rainfall. This figure exceeds the number maintained on the same land during the heyday of Peter French, the cattle baron who took over the Blitzen Valley in the 1870's and whose meteoric career was cut short by a nester's bullet in 1897.

An adolescent succulent Canadian thistle, one of the weeds brought to the area in farmers' grains, is a major target for extermination on the refuge. *Tordon* herbicide has been found to be highly effective against the hardy weed.



Dead Canadian thistle root, from a patch treated with *Tordon* the previous year, is displayed by Del Pierce, refuge assistant manager. There is a heavy kill of thistle in the immediate background.

"OUTDOOR HOTEL"...



Refuge manager John Scharff relies on his long-time knowledge and judgment to achieve a desired balance of forage and cover for both waterfowl and cattle on the big Malheur Refuge.

Lying above 4,000 feet elevation and in a semi-arid climate hundreds of miles from any major market, the marsh and sagebrush uplands of Harney County have proven to be unfit for general farming. They are excellent for raising stock. But it took many years and many conflicts between nesters (land-claiming settlers, squatters and homesteaders) and stockmen to prove it.

As one old nester asked John Scharff: "Why should I pay $300 an acre for land in Napa County, California, when I can get 320 acres here for free?"

Homesteaders got off where the railroad ended and were directed to land advertised as having "water within easy reach." But even 80 feet of hard drilling failed to bring enough water. Water districts were formed to pump from springs, and some flourished for a while, but none survived for long.

A shortage of water gradually forced homesteaders elsewhere. In the early 1900's, even before woman suffrage neighboring Catlow Valley cast 200 votes. Today the valley can barely muster a tenth that many—from two large ranches.

A few apple trees around the old Peter French "P" ranch . . . old cabins without windows and their weathered doors toppled . . . rusted hinges . . . rotted fence posts lying on the ground . . . the trails that fade back into the sagebrush . . . are all sad reminders of unsuccessful homesteading days.

Among the most unfortunate of the reminders, however, are weeds. Weeds came in the grain that farmers planted.

Canada thistle is a major problem. When digging starts, its hardy, dormant seeds start growing. And digging has been a constant activity with Scharff. His first job when he came to the Sod House Ranch on the refuge in August of 1935 was to start digging a basement for a home. In a sense, he and his associates have been digging ever since, as the building of roads, dykes and dams has been constantly underway.

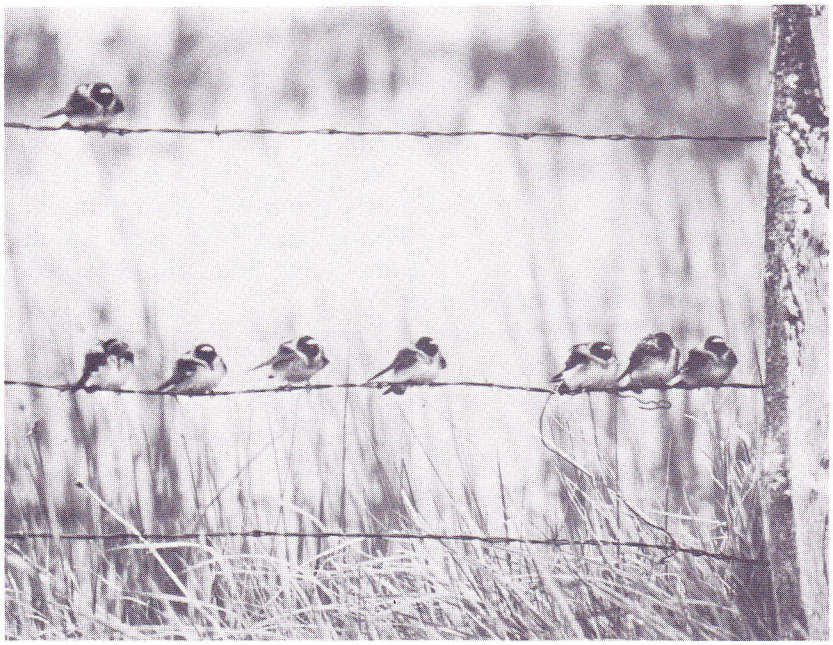
"Weeds appear whenever we break ground," says Scharff. "Even a badger's set will produce a few weeds from the turned-up soil."

White top is another weed that has followed man's trail through the sagebrush. Old sheep camps, now in Nevada and Idaho, and drover trails are marked by the outline of weeds.

The stilt-legged striped bird is the American Avocet, one of the local nesting waterfowl. The black bird is the rare white-face ibis of which there are seldom more than 20 on the refuge.

When 2,4-D weedkiller first came on the market it was the first big step up from hoeing Canada thistle. It helped but it was far from the final answer to this tough, deep-rooted perennial.

Besides crowding out desirable



Cliff swallows are common on the Malheur Refuge. They build mud nests in the lava rims, in old buildings and other sheltered areas.

forage, thistles sap water that is the foundation of forage growth on the refuge. Thistle-killing is, thus, given high priority.

Today, John Scharff and assistant manager Del Pierce feel they have an effective herbicide that will kill Canada thistle on a single pass. It is *Tordon* herbicide, produced by The Dow Chemical Company.

Although unfit for general farming, the marsh and sagebrush uplands of Harney County are excellent for raising stock. This is some of the cattle owned by some 70 holders of grazing permits.

after the thistle is gone . . ."

Pierce, a Humboldt State graduate in the fast-expanding field of wildlife management, is treating 500 acres of Canada thistle with *Tordon* this year. Boom rigs are used to treat heavy, widespread infestations.

"The great thing about our experiences with *Tordon* is that the grass takes over after the thistle is dead. We've been using it for two years. It leaves the saltgrass, bunchgrass and native meadow grasses that we want," says Pierce.

Headquarters for the refuge is Sod House Ranch where Scharff

A Wilson's warbler, just banded, is ready to be released by an assistant refuge biologist. The bird was caught in a mist net near the headquarters and was one of the last of its kind to leave the area on its northerly spring migration from Mexico or South America. Between March and mid-June of this year, one biologist banded 1,400 birds of approximately 60 species.

Wildlife photographers at Malheur record some of the hundreds of thousands of migrant wildfowl on film every year. They never run out of subjects.

lives. It is beautifully landscaped with willows, conifers, Russian olives, flowering plants and roses —all planted in the past 31 years.

There are two large lakes on the refuge—the Malheur and the Harney. Both are shallow and there are existing reports on area lake conditions that date back to 1826 when Peter Skene Ogden and his band of beaver trappers of Hudson Bay first saw the lakes. During one dry spell in the early '30s, well-preserved buffalo and grizzly bear skulls, hundreds of years old, were uncovered.

It requires a lot of planning to achieve ecological balance for each season on the Malheur Refuge. Nesting grounds are kept in the marshy lands for sandhill cranes, egrets, eagles, avocets, pelicans, grebes, terns, curlews and exotic songbirds, as well as for duck broods that frequent the huge outdoor hotel in July and August. John Scharff's long-time knowledge and judgment are invaluable in achieving the correct balance of forage and cover for both ducks and cattle.

Assisting Scharff, besides Pierce, are two wildlife biologists —University of Missouri graduate Harold Duebbert, and Fred Zeillemaker, recent graduate of Humboldt State College, Arcata, California.

Scharff's oversize "hotel" always has enough "rooms." But it is also important that there be enough showers and food for all the guests—and that they are not disturbed.